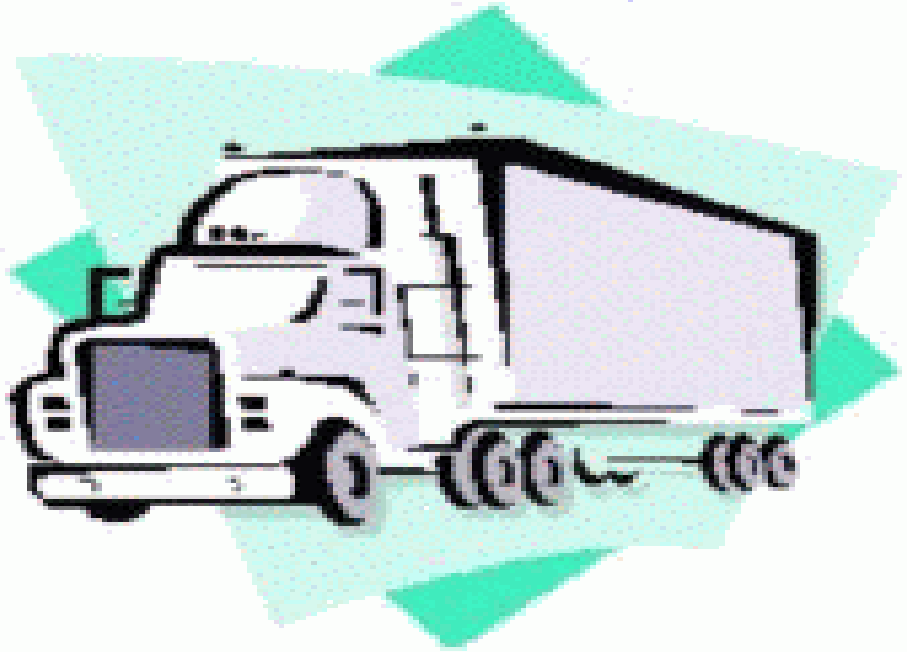


CTWIM

Rich Quinley

California Department of Transportation

NATMEC 2002 North American Traffic Monitoring Exhibition & Conference
ICWIM International Conference on Weigh in Motion

Caltrans

What is the CTWIM Suite?

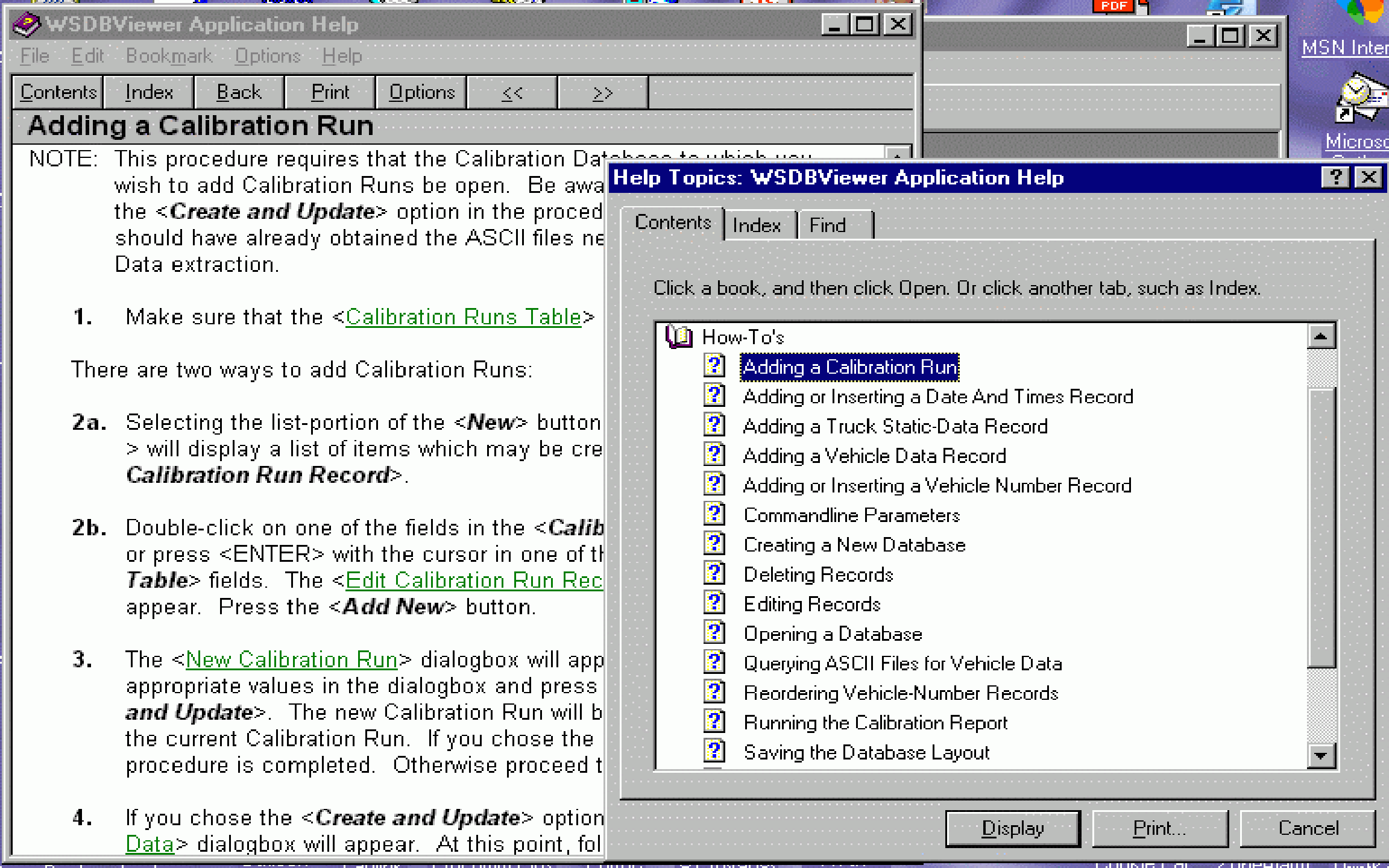
A Windows based set of applications that can be used by the WIM analyst to:

- Process data from test trucks to make decisions regarding the calibration, acceptance, and validation of a WIM system
- Monitor the truck traffic stream through a WIM site for proper system component operation, system calibration, and truck operating characteristics

CTWIM SUITE

What documentation is there for the CTWIM Suite?

- On-line Help screens
- Hardcopy manual


WSDBViewer Application Help
File Edit Bookmark Options Help
Contents Index Back Print Options << >>
Adding a Calibration Run
NOTE: This procedure requires that the Calibration Da
wish to add Calibration Runs be open. Be awa
the <Create and Update> option in the proced
should have already obtained the ASCII files ne
Data extraction.
1. Make sure that the <Calibration Runs Table>
There are two ways to add Calibration Runs:
2a. Selecting the list-portion of the <New> button
> will display a list of items which may be cre
Calibration Run Record>.
2b. Double-click on one of the fields in the <Calib
or press <ENTER> with the cursor in one of th
Table> fields. The <Edit Calibration Run Rec
appear. Press the <Add New> button.
3. The <New Calibration Run> dialogbox will app
appropriate values in the dialogbox and press
and Update>. The new Calibration Run will b
the current Calibration Run. If you chose the
procedure is completed. Otherwise proceed t
4. If you chose the <Create and Update> option
Data> dialogbox will appear. At this point, fol
Help Topics: WSDBViewer Application Help
Contents Index Find
Click a book, and then click Open. Or click another tab, such as Index.
How-To's
Adding a Calibration Run
Adding or Inserting a Date And Times Record
Adding a Truck Static-Data Record
Adding a Vehicle Data Record
Adding or Inserting a Vehicle Number Record
Commandline Parameters
Creating a New Database
Deleting Records
Editing Records
Opening a Database
Querying ASCII Files for Vehicle Data
Reordering Vehicle-Number Records
Running the Calibration Report
Saving the Database Layout
Display Print... Cancel
MSN Inter
Microso

CTWIM Suite Manual

Written by Carl E. McMillin

For the California Dept. of Transportation

Prepared by <MakeManual> on 11/13/2001 08:13:46
from multiple Help Files composed with Help-And-Manual v2.6.3

Section Break (Next Page)

Table of Contents

What is needed to use the program?

Both the calibration and traffic stream analysis applications import WIM data from ASCII truck record text files formatted in accordance with Caltrans specifications

CTWIM SUITE

ASCII TRUCK RECORD FILE FORMAT

FIELD	LENGTH	DECIMAL PLACES	STARTS IN COLUMN
LANE	1		1
MONTH	2		3
DAY	2		6
YEAR	2		9
HOUR	2		12
MINUTE	2		15
SECOND	2		18
VEHICLE NO.	5		21
CLASS	2		27
GROSS WEIGHT	6	1	30
LENGTH	6	1	37
SPEED	5	1	44
VIOLATION CODE	3		50
AXLE 1 RT. WEIGHT	4	1	54
AXLE 1 LT. WEIGHT	4	1	59
AXLE 2 RT. WEIGHT	4	1	64
AXLE 2 LT. WEIGHT	4	1	69
AXLE 1-2 SPACING	4	1	74
AXLE 9 LT. WEIGHT	4	1	174
AXLE 8-9 SPACING	4	1	179
VENDOR SPECIFIC OPTIONAL FIELDS			184

Note:

Lengths in Feet

Weights in Lbs/1000

This file shall include every "truck record" contained in the daily data file. Each field shall be comma delimited and padded with blanks to complete the fixed logical record

```
1, 1, 6, 2, 9,12,48, 4397, 9,  76.7,  70.3, 62.8,  0, 5.7, 6.1, 7.5, 7.5,18.2, 7.6, 8.1, 4.4,
4, 1, 6, 2, 9,13,37, 4421, 3,   7.5,  19.0, 72.1,  0, 1.9, 2.3, 1.5, 1.6,13.2,    ,    ,    ,
4, 1, 6, 2, 9,14,53, 4462, 3,   7.9,  21.4, 62.8,  0, 1.7, 1.8, 1.9, 2.2,12.5,    ,    ,    ,
4, 1, 6, 2, 9,15, 4, 4465, 9,  37.1,  63.7, 57.8,  0, 5.0, 4.8, 3.8, 3.3,12.4, 3.8, 3.6, 4.1,
3, 1, 6, 2, 9,15, 4, 4466, 3,   6.1,  19.4, 75.8,  0, 1.9, 1.6, 1.3, 1.1,13.2,    ,    ,    ,
3, 1, 6, 2, 9,15,28, 4478, 3,   7.4,  15.8, 83.3,  0, 2.3, 1.9, 1.6, 1.4,11.8,    ,    ,    ,
4, 1, 6, 2, 9,15,32, 4481, 5,  34.5,  55.0, 62.8,  2, 6.0, 6.2,11.6,10.5,20.0,    ,    ,    ,
1, 1, 6, 2, 9,15,46, 4486, 9,  50.7,  70.2, 57.8,  0, 5.9, 5.5, 4.9, 4.4,15.4, 4.5, 4.1, 4.3,
4, 1, 6, 2, 9,16,41, 4515, 9,  59.7,  65.2, 57.8,  0, 6.0, 5.8, 7.4, 7.3,12.5, 7.8, 6.8, 4.3,
4, 1, 6, 2, 9,16,53, 4522, 5,  13.5,  31.0, 57.8,  0, 2.0, 2.1, 4.6, 4.6,16.7,    ,    ,    ,
2, 1, 6, 2, 9,17, 0, 4528, 5,  11.1,  15.4, 78.9,  0, 2.8, 2.8, 2.6, 2.6,10.9,    ,    ,    ,
4, 1, 6, 2, 9,17, 5, 4531, 3,   6.4,  16.5, 62.8,  0, 1.6, 1.9, 1.2, 1.5,11.0,    ,    ,    ,
3, 1, 6, 2, 9,17,10, 4537, 2,   7.2,  11.7, 65.9,  0, 1.8, 1.8, 1.6, 1.6, 9.4,    ,    ,    ,
4, 1, 6, 2, 9,17,11, 4538, 8,  20.8,  55.6, 52.2,  0, 2.8, 2.7, 5.9, 5.5,18.0, 1.1, 1.0,20.2,
2, 1, 6, 2, 9,17,35, 4546, 5,   8.2,  19.8, 65.2,  0, 1.8, 1.7, 2.4, 2.2,10.4,    ,    ,    ,
4, 1, 6, 2, 9,17,39, 4550,12,  66.0,  76.0, 62.8,  0, 3.4, 3.8, 5.7, 4.8,11.2, 6.2, 4.8, 4.5,
1, 1, 6, 2, 9,17,55, 4559, 5,  13.6,  44.5, 62.8,  0, 2.2, 2.2, 2.4, 2.3,13.4, 1.2, 0.9,19.3,
2, 1, 6, 2, 9,18,17, 4565, 5,  10.6,  11.4, 70.8,  0, 3.0, 2.9, 2.2, 2.2, 9.1,    ,    ,    ,
1, 1, 6, 2, 9,18,20, 4566,14,  81.0,  63.5, 55.3,192, 4.9, 5.0, 8.8, 9.7,16.0, 8.4, 6.9, 4.2,
4, 1, 6, 2, 9,19,16, 4597, 5,   9.0,  13.5, 72.1,  0, 2.7, 2.7, 1.7, 1.7, 8.5,    ,    ,    ,
2, 1, 6, 2, 9,20, 7, 4639, 2,   6.8,  11.4, 67.7,  0, 2.0, 2.0, 1.3, 1.3, 8.3,    ,    ,    ,
4, 1, 6, 2, 9,20,24, 4648, 9,  53.3,  73.5, 65.9,  0, 5.6, 6.0, 6.0, 5.5,17.0, 5.6, 5.7, 4.3,
3, 1, 6, 2, 9,21,44, 4697, 5,   8.9,  13.4, 69.0,  0, 2.3, 2.3, 2.1, 2.1, 9.7,    ,    ,    ,
4, 1, 6, 2, 9,22,31, 4728, 9,  66.0,  81.1, 57.8,  0, 5.0, 5.4, 7.0, 6.7,21.2, 5.9, 7.0, 4.3,
2, 1, 6, 2, 9,22,38, 4732, 5,  10.0,  14.9, 67.7,  0, 2.8, 2.7, 2.2, 2.1,10.4,    ,    ,    ,
1, 1, 6, 2, 9,22,52, 4740, 5,  12.8,  12.8, 75.8,  0, 3.3, 3.3, 3.0, 3.0, 9.4,    ,    ,    ,
1, 1, 6, 2, 9,23,19, 4759, 3,   6.8,  20.9, 80.2,  0, 1.7, 1.8, 1.5, 1.5,14.5,    ,    ,    ,
4, 1, 6, 2, 9,23,23, 4762, 2,   7.7,  13.5, 75.2,  0, 2.2, 2.3, 1.5, 1.5, 8.7,    ,    ,    ,
4, 1, 6, 2, 9,23,38, 4774, 9,  76.4,  81.0, 60.9,  0, 5.6, 5.6, 8.4, 8.1,20.6, 7.9, 7.9, 4.3,
1, 1, 6, 2, 9,24, 2, 4782, 5,  11.4,  15.9, 65.9,  0, 3.1, 3.1, 2.5, 2.5, 9.7,    ,    ,    ,
3, 1, 6, 2, 9,24,20, 4790, 2,   6.6,  13.4, 67.7,  0, 1.9, 1.9, 1.2, 1.3, 8.5,    ,    ,    ,
```

Where do these files come from?

These ASCII text files are created from the "raw" downloaded WIM truck records

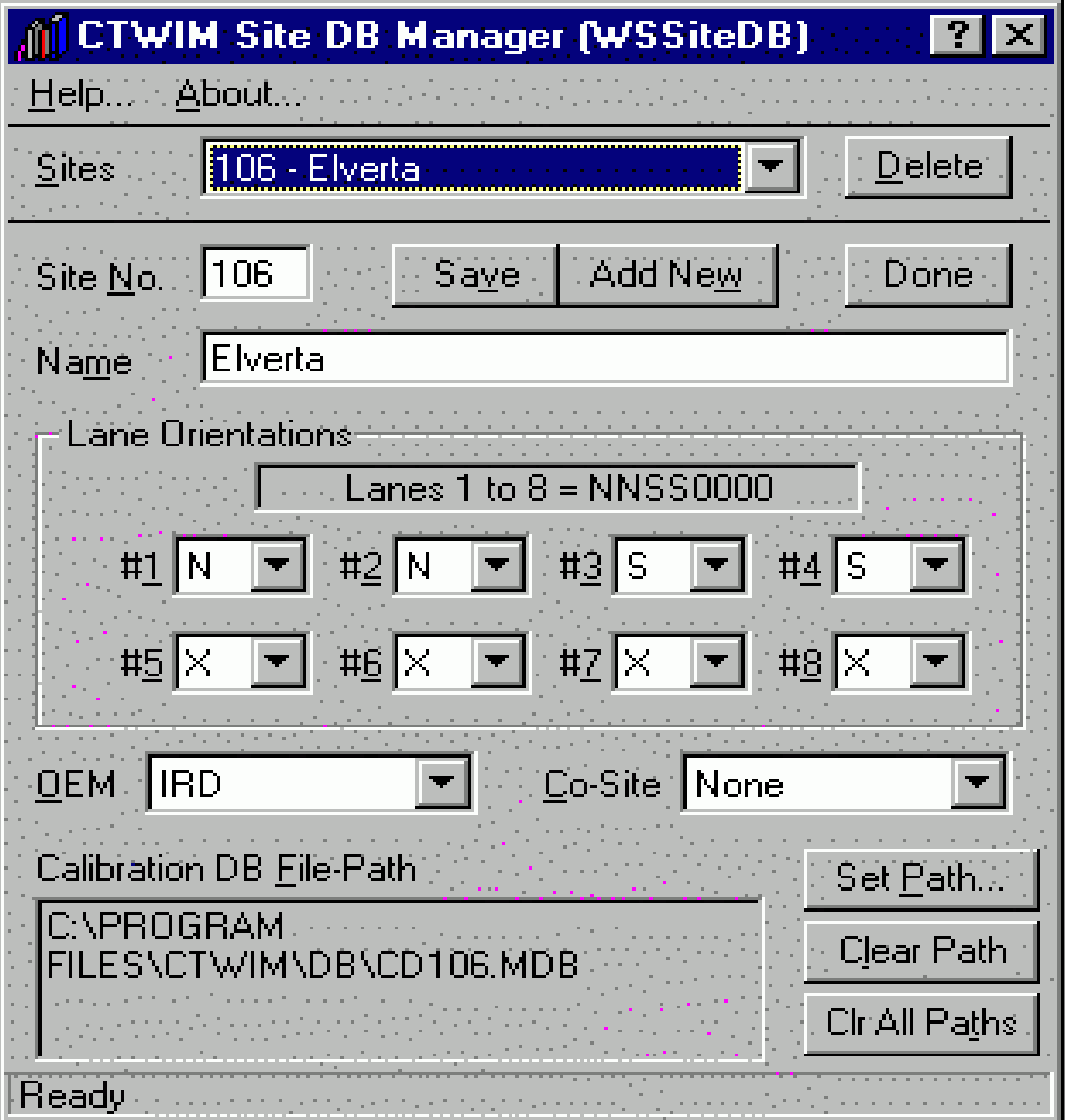
- PAT- Utility included in their application software
- IRD- Utility available in their application software (std. for CalTrans)
- ECM, PEEK- Will make utility available upon request
- Can create from spreadsheets, tables, etc. using import/export

Bending Plate vs. Piezo Systems

- Program designed around bending plate systems with individual left and right wheel weights
- Calibration analysis application requires wheel weights- for "axle weight" systems, can use spreadsheet to split axle weights into wheel weights
- Traffic stream analysis application can use either wheel weights or axle weights

What is my first step?

Both the calibration and traffic stream analysis applications utilize a common WIM system configuration database


CTWIM Site DB Manager (WSSiteDB)
Help...
About...
Sites
106 - Elverta
Delete
Site No.
106
Save
Add New
Done
Name
Elverta
Lane Orientations
Lanes 1 to 8 = NNSS0000
#1 N
#2 N
#3 S
#4 S
#5 X
#6 X
#7 X
#8 X
OEM
IRD
Co-Site
None
Calibration DB File-Path
C:\PROGRAM FILES\CTWIM\DB\CD106.MDB
Set Path...
Clear Path
Clr All Paths
Ready

WIMSys - Evaluate traffic stream

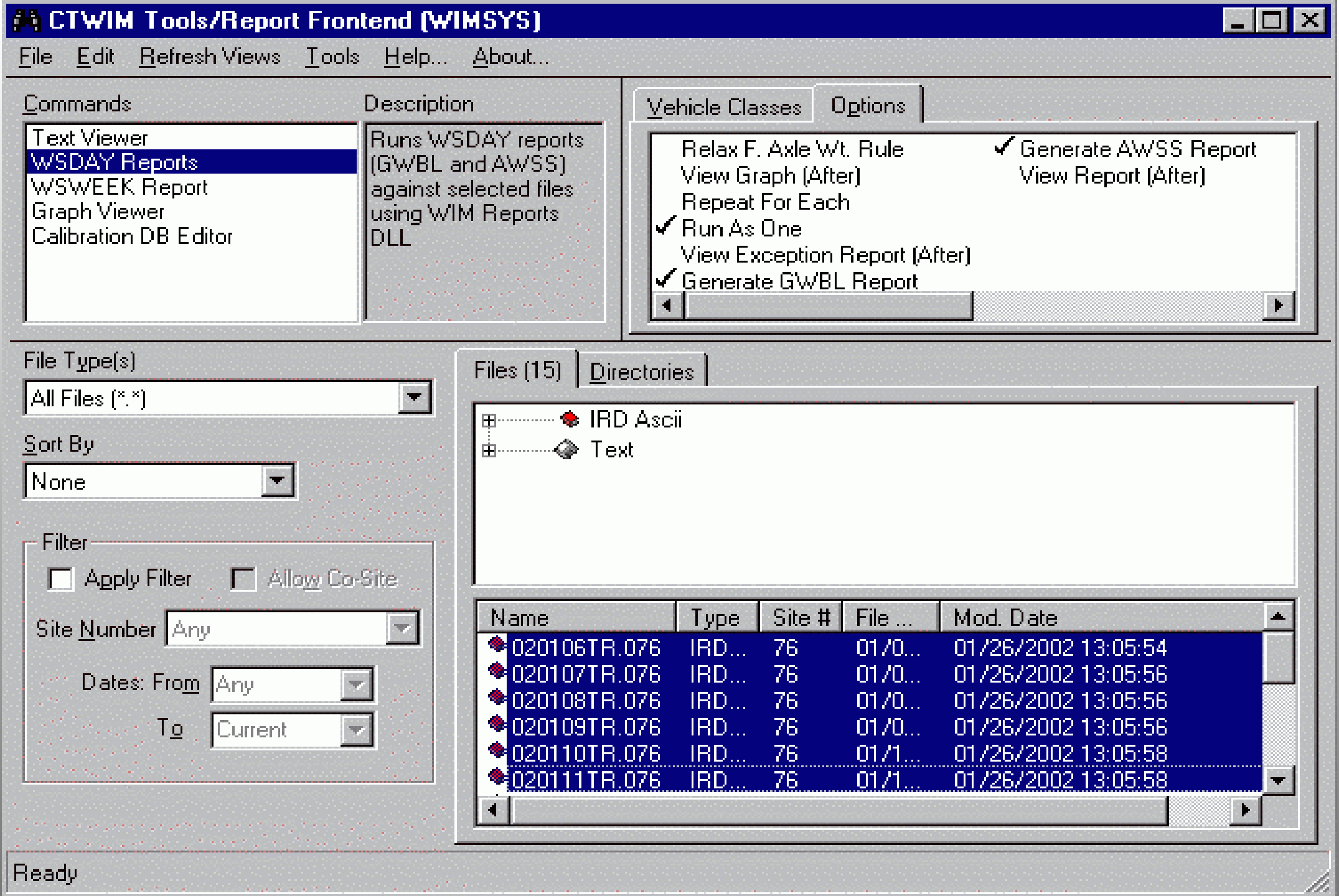
The purpose of this application is to evaluate the maintenance of calibration of a WIM system by comparing large samples of specified traffic stream data elements with known operating characteristics of certain vehicle types

Caltrans

CTWIM SUITE

WIMSys - Evaluate traffic stream

- Very easy to use
- Use seven days of data (Sun thru Sat) to avoid daily bias
- Looks at Class 9, Class 11, and Class 14 (Caltrans uses Class 14 to capture the "32" truck-trailer combinations due to their unique operating characteristics)
- User selects desired class or classes

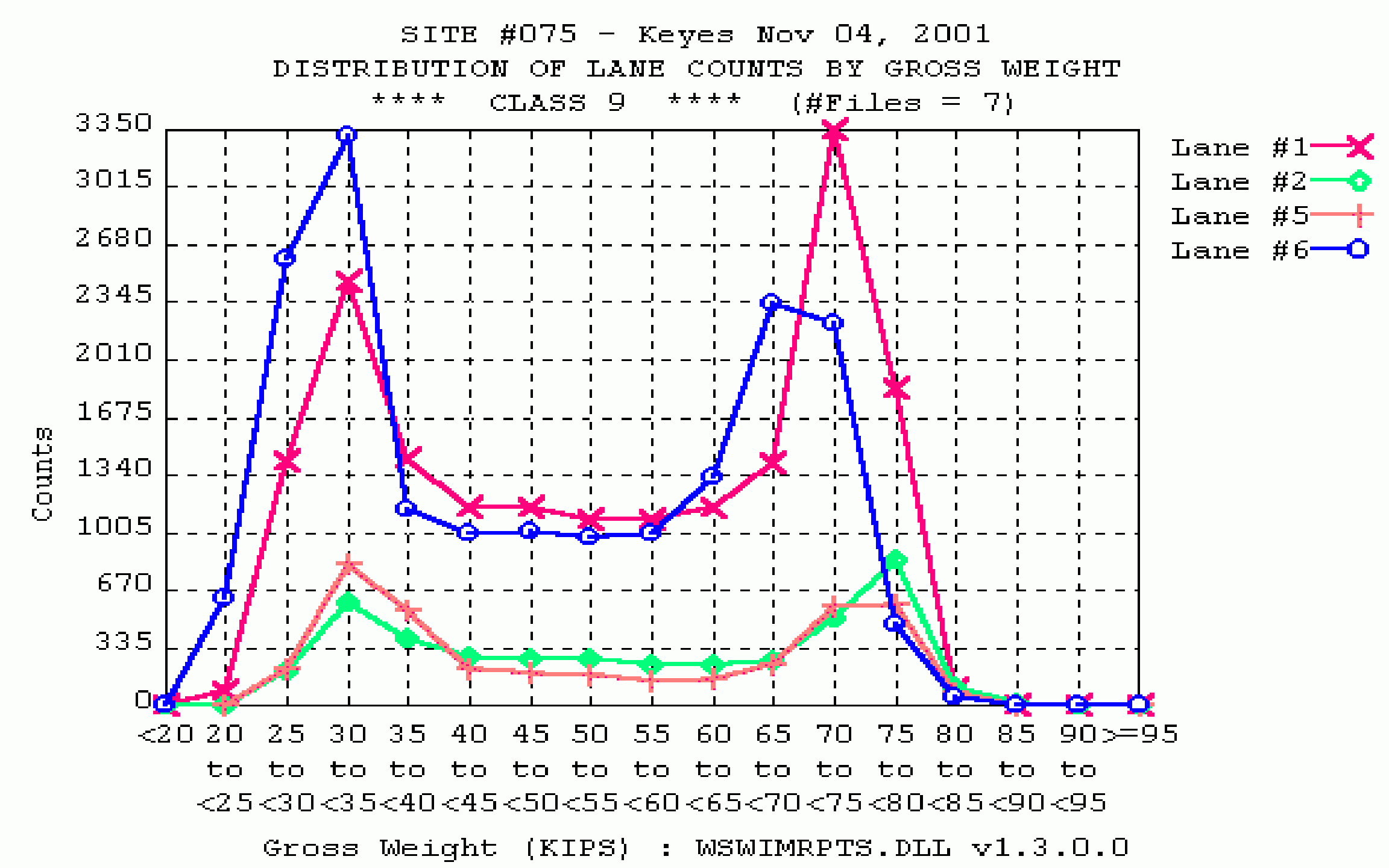

CTWIM Tools/Report Frontend (WIMSYS)
File Edit Refresh Views Tools Help... About...
Commands
Text Viewer
WSDAY Reports
WSWEEK Report
Graph Viewer
Calibration DB Editor
Description
Runs WSDAY reports (GWBL and AWSS) against selected files using WIM Reports DLL
Vehicle Classes
Options
Relax F. Axle Wt. Rule
View Graph (After)
Repeat For Each
Run As One
View Exception Report (After)
Generate GWBL Report
Generate AWSS Report
View Report (After)
File Type(s)
All Files (*.*)
Sort By
None
Filter
Apply Filter
Allow Co-Site
Site Number
Any
Dates: From
Any
To
Current
Files (15)
Directories
IRD Ascii
Text
Name
Type
Site #
File ...
Mod. Date
020106TR.076 IRD... 76 01/0... 01/26/2002 13:05:54
020107TR.076 IRD... 76 01/0... 01/26/2002 13:05:56
020108TR.076 IRD... 76 01/0... 01/26/2002 13:05:56
020109TR.076 IRD... 76 01/0... 01/26/2002 13:05:56
020110TR.076 IRD... 76 01/1... 01/26/2002 13:05:58
020111TR.076 IRD... 76 01/1... 01/26/2002 13:05:58
Ready

WIMSys - Evaluate traffic stream

What are the outputs of this application?

DISTRIBUTION OF LANE COUNTS BY GROSS WEIGHT
SITE #075 - Keyes Nov 04, 2001
**** CLASS 9 **** (#Files = 7)

Gross Wt Range	LANE #1 Count	LANE #1 %	LANE #1 Avg Speed	LANE #2 Count	LANE #2 %	LANE #2 Avg Speed	LANE #5 Count	LANE #5 %	LANE #5 Avg Speed	LANE #6 Count	LANE #6 %	LANE #6 Avg Speed
< 20.0	3	0.0	61.1	1	0.0	60.9	0	0.0	0.0	11	0.0	58.2
20.0 TO 24.9	85	0.4	56.6	5	0.1	62.1	10	0.2	62.8	631	3.4	58.2
25.0 TO 29.9	1427	8.0	58.8	208	4.8	62.2	219	5.4	62.4	2598	14.3	58.8
30.0 TO 34.9	2466	13.8	59.3	598	13.9	62.8	831	20.6	62.7	3304	18.2	58.8
35.0 TO 39.9	1435	8.0	59.0	394	9.1	62.8	558	13.8	62.8	1146	6.3	58.4
40.0 TO 44.9	1154	6.4	59.2	286	6.6	62.2	215	5.3	62.7	1004	5.5	58.5
45.0 TO 49.9	1157	6.5	59.0	279	6.5	63.2	195	4.8	62.3	1014	5.6	58.3
50.0 TO 54.9	1087	6.1	59.1	274	6.3	62.9	186	4.6	61.9	977	5.3	58.3
55.0 TO 59.9	1085	6.1	59.1	241	5.6	62.4	149	3.7	62.0	998	5.5	58.1
60.0 TO 64.9	1150	6.4	58.9	240	5.6	62.5	162	4.0	62.2	1325	7.3	58.3
65.0 TO 69.9	1407	7.9	58.8	265	6.1	62.5	237	5.8	62.3	2333	12.8	58.5
70.0 TO 74.9	3345	18.8	58.5	512	11.9	62.9	579	14.3	62.4	2215	12.2	58.6
75.0 TO 79.9	1848	10.3	59.1	847	19.7	62.2	595	14.7	62.1	480	2.6	58.5
80.0 TO 84.9	103	0.5	58.4	116	2.7	61.9	77	1.9	61.6	48	0.2	59.2
85.0 TO 89.9	9	0.0	56.2	14	0.3	60.1	8	0.1	63.0	5	0.0	57.1
90.0 TO 94.9	5	0.0	58.3	2	0.0	64.0	0	0.0	0.0	4	0.0	57.5
>= 95.0	6	0.0	58.6	2	0.0	61.5	2	0.0	59.6	2	0.0	57.2
All	17772	40.2	59.0	4284	9.6	62.6	4023	9.1	62.5	18095	40.9	58.6
Avg Gross Wt	54.1	n/a		56.1	n/a		52.8	n/a		48.5	n/a	
Standard Dev	17.5	n/a		18.0	n/a		18.5	n/a		17.5	n/a	
Avg Axle 1 Wt	10.2	n/a		10.5	n/a		10.7	n/a		9.8	n/a	
Standard Dev	1.0	n/a		1.1	n/a		1.1	n/a		1.0	n/a	

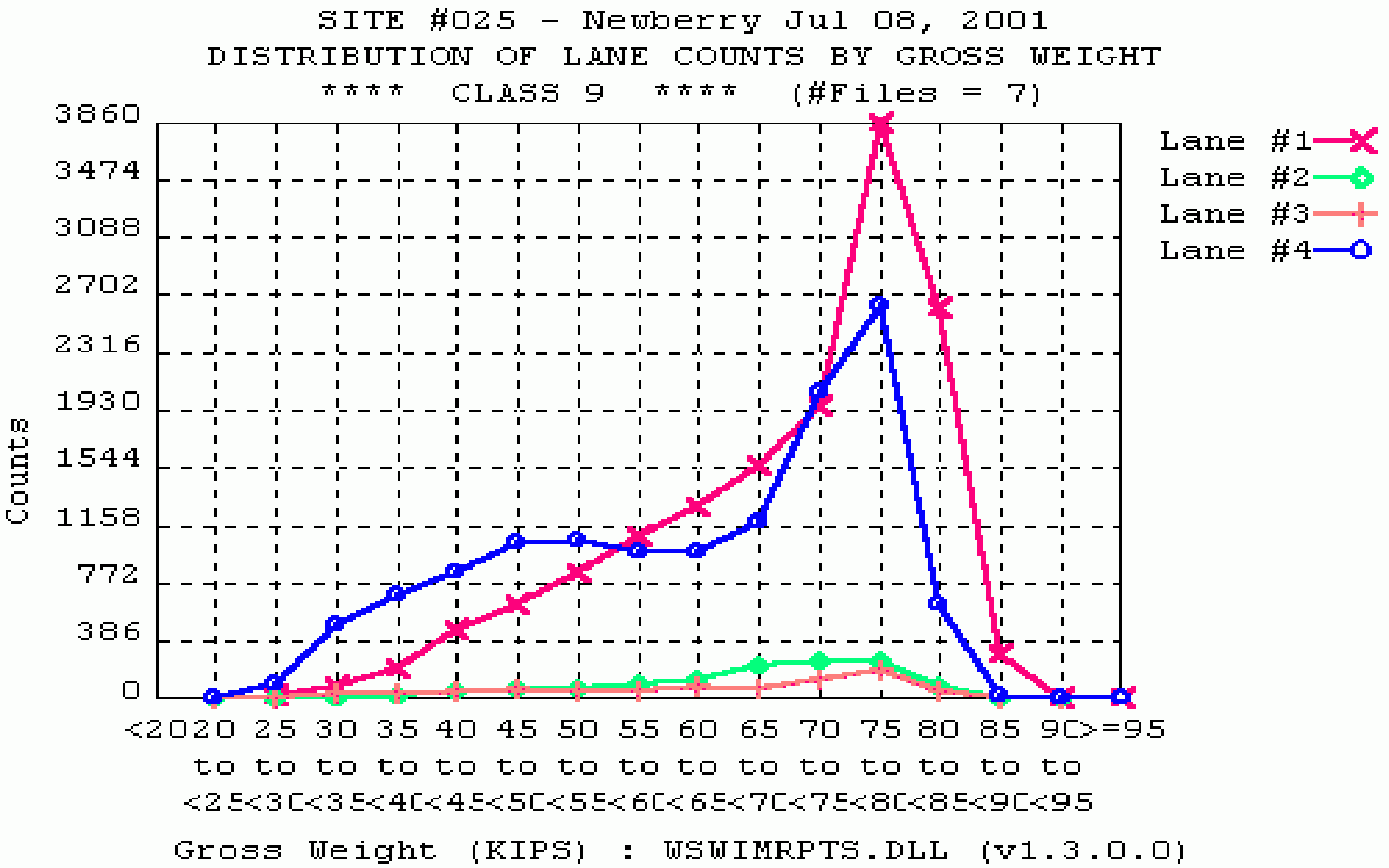

SITE #075 - Keyes Nov 04, 2001
DISTRIBUTION OF LANE COUNTS BY GROSS WEIGHT
**** CLASS 9 **** (#Files = 7)
Counts
3350
3015
2680
2345
2010
1675
1340
1005
670
335
0
Lane #1
Lane #2
Lane #5
Lane #6
<20 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90>=95
to to to to to to to to to to to to to to to
<25<30<35<40<45<50<55<60<65<70<75<80<85<90<95
Gross Weight (KIPS) : WSWIMRPTS.DLL v1.3.0.0

DISTRIBUTION OF LANE COUNTS BY GROSS WEIGHT

SITE #025 - Newberry Jul 08, 2001

**** CLASS 9 **** (#Files = 7)

Gross Wt Range	LANE #1 Count	LANE #1 %	LANE #1 Avg Speed	LANE #2 Count	LANE #2 %	LANE #2 Avg Speed	LANE #3 Count	LANE #3 %	LANE #3 Avg Speed	LANE #4 Count	LANE #4 %	LANE #4 Avg Speed
< 20.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
20.0 TO 24.9	0	0.0	0.0	1	0.0	63.5	2	0.2	60.2	10	0.0	58.6
25.0 TO 29.9	22	0.1	59.7	5	0.3	67.6	8	0.9	63.2	93	0.7	59.9
30.0 TO 34.9	77	0.5	61.5	9	0.7	65.2	33	3.8	64.4	501	3.9	60.3
35.0 TO 39.9	209	1.4	61.6	30	2.3	65.4	43	4.9	64.6	691	5.4	61.3
40.0 TO 44.9	467	3.1	61.0	54	4.2	65.0	56	6.4	65.9	843	6.6	60.7
45.0 TO 49.9	632	4.2	61.0	68	5.3	66.1	63	7.2	65.7	1047	8.2	61.3
50.0 TO 54.9	841	5.6	61.2	74	5.7	64.9	59	6.8	67.8	1059	8.3	61.4
55.0 TO 59.9	1089	7.3	61.6	99	7.7	66.0	60	6.9	65.1	979	7.6	61.3
60.0 TO 64.9	1287	8.6	61.5	123	9.6	65.6	82	9.4	65.3	986	7.7	62.1
65.0 TO 69.9	1561	10.4	62.1	214	16.7	67.9	76	8.7	66.2	1183	9.2	61.7
70.0 TO 74.9	1956	13.1	62.6	258	20.2	66.6	131	15.1	66.5	2056	16.1	61.7
75.0 TO 79.9	3853	25.8	62.0	248	19.4	65.0	184	21.2	66.4	2634	20.6	60.9
80.0 TO 84.9	2611	17.5	61.1	90	7.0	64.4	57	6.5	68.7	640	5.0	60.6
85.0 TO 89.9	298	1.9	59.4	3	0.2	58.0	11	1.2	73.8	22	0.1	59.6
90.0 TO 94.9	5	0.0	61.3	1	0.0	67.5	1	0.1	75.1	2	0.0	55.7
>= 95.0	5	0.0	60.1	0	0.0	0.0	0	0.0	0.0	1	0.0	57.8
All	14913	50.0	61.7	1277	4.2	66.0	866	2.9	66.3	12747	42.7	61.3
Avg Gross Wt	69.4	n/a		66.1	n/a		63.1	n/a		62.1	n/a	
Standard Dev	12.3	n/a		12.1	n/a		15.1	n/a		14.8	n/a	
Avg Axle 1 Wt	11.4	n/a		10.7	n/a		11.6	n/a		11.0	n/a	
Standard Dev	0.8	n/a		0.9	n/a		0.9	n/a		0.8	n/a	


SITE #025 - Newberry Jul 08, 2001
DISTRIBUTION OF LANE COUNTS BY GROSS WEIGHT
**** CLASS 9 **** (#Files = 7)
Counts
3860
3474
3088
2702
2316
1930
1544
1158
772
386
0
Lane #1
Lane #2
Lane #3
Lane #4
<20 20 to <25 25 to <30 30 to <35 35 to <40 40 to <45 45 to <50 50 to <55 55 to <60 60 to <65 65 to <70 70 to <75 75 to <80 80 to <85 85 to <90 >=95
Gross Weight (KIPS) : WSWIMRPTS.DLL (v1.3.0.0)

DISTRIBUTION OF AVERAGE WEIGHTS & SPACINGS BY SPEED

SITE #025 - Newberry Jul 08, 2001 (#Files = 7)

*** LANE #1 *** **** CLASS 9 ****

Speed Range	Axle 1 Left Wheel	Axle 1 Right Wheel	Steer Axle	Tractor Tandem Axles	Trailer Tandem Axles	Vehicle Gross	All	Over Weight	Percent Over Weight	Tractor Tandem Axles	Trailer Tandem Axles
	WEIGHTS						COUNTS			SPACINGS	
< 25.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	-	0.0	0.0
25.0 TO 29.9	5.8	5.9	11.8	31.3	31.7	74.8	4	2	50.0	4.2	3.9
30.0 TO 34.9	5.5	5.7	11.3	29.7	31.8	72.9	17	3	17.6	4.3	5.4
35.0 TO 39.9	5.5	5.6	11.2	29.7	30.0	71.0	67	15	22.3	4.2	4.2
40.0 TO 44.9	5.6	5.7	11.4	28.0	27.6	67.0	84	19	22.6	4.3	4.3
45.0 TO 49.9	5.8	5.6	11.4	27.0	25.4	63.9	58	13	22.4	4.2	4.7
50.0 TO 54.9	5.8	5.6	11.5	29.3	28.7	[redacted]		334	39.4	4.2	4.5
55.0 TO 59.9	5.7	5.6	11.4	29.1	28.5			1584	37.9	4.3	4.6
60.0 TO 64.9	5.7	5.6	11.3	29.5	28.5			2222	36.8	4.3	4.6
65.0 TO 69.9	5.5	5.6	11.1	30.1	28.4			890	37.3	4.3	4.6
70.0 TO 74.9	5.4	5.5	11.0	30.6	28.4			330	33.7	4.3	4.7
>= 75.0	5.2	5.4	10.6	30.6	27.9	69.1	265	73	27.5	4.5	4.9
Average All	[redacted]		11.4	29.6	28.5	69.4	14913	5485	36.7	[redacted]	4.6
Standard Dev			0.8	5.8	6.9	12.3	n/a	n/a	n/a	0.2	1.7

Distribution of Gross Weight by Day of Month: Site No. 21 - Mojave
From 08/05/2001 Through 08/11/2001 Class 9 .... Westbound

Gross Wt. Range	Sun 05	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10	Sat 11	Totals
< 20.0	2	6	8	6	4	4	2	32
20.0 TO 24.9	11	53	60	51	42	71	22	310
25.0 TO 29.9	22	73	98	91	102	111	40	537
30.0 TO 34.9	19	79	77	66	68	71	40	420
35.0 TO 39.9	26	64	70	74	76	79	52	441
40.0 TO 44.9	31	82	96	90	67	82	47	495
45.0 TO 49.9	37	74	115	85	112	80	74	577
50.0 TO 54.9	27	70	132	110	103	112	96	650
55.0 TO 59.9	66	73	171	143	146	156	157	912
60.0 TO 64.9	97	134	255	247	202	265	240	1440
65.0 TO 69.9	137	253	618	466	422	478	497	2871
70.0 TO 74.9	171	396	815	676	578	677	647	3960
75.0 TO 79.9	114	283	507	431	395	398	382	2510
80.0 TO 84.9	72	128	248	220	209	222	190	1289
85.0 TO 89.9	5	25	32	51	33	35	23	204
90.0 TO 94.9	1	1	4	3	1	7	0	17
>= 95.0	1	2	1	2	3	3	1	13
All	839	1796	3307	2812	2563	2851	2510	16678
Avg. Gross Wt.	64.1	62.5	65.1	65.0	64.3	64.3	66.6	64.7
Standard Dev.	14.8	17.2	14.9	15.3	15.6	16.9	12.8	15.5
Avg. Axle 1 Wt.	11.3	11.3	11.3	11.2	11.3	11.3	11.3	11.3
Standard Dev.	1.2	[redacted]	1.2	1.2	1.2	1.5	1.1	1.5

Distribution of Gross Weight by Day of Month: Site No. 21 - Mojave
From 08/05/2001 Through 08/11/2001 Class 9 .... Eastbound

Gross Wt. Range	Sun 05	Mon 06	Tue 07	Wed 08	Thu 09	Fri 10	Sat 11	Totals
< 20.0	0	0	0	1	0	1	0	2
20.0 TO 24.9	2	2	9	5	7	7	12	44
25.0 TO 29.9	18	43	46	38	48	52	35	280
30.0 TO 34.9	63	212	194	150	207	246	137	1209
35.0 TO 39.9	81	197	189	178	153	190	103	1091
40.0 TO 44.9	129	130	142	102	131	113	68	815
45.0 TO 49.9	151	151	136	112	136	118	51	855
50.0 TO 54.9	131	117	124	114	138	98	70	792
55.0 TO 59.9	127	126	102	102	103	79	74	713
60.0 TO 64.9	141	98	94	113	124	76	58	704
65.0 TO 69.9	153	126	131	112	132	81	67	802
70.0 TO 74.9	311	227	221	234	288	188	155	1624
75.0 TO 79.9	290	288	237	250	277	178	150	1670
80.0 TO 84.9	71	55	62	80	79	47	39	433
85.0 TO 89.9	4	2	5	4	3	3	2	23
90.0 TO 94.9	0	0	2	0	0	0	0	2
>= 95.0	0	1	2	1	3	0	0	7
All	1672	1775	1696	1596	1829	1477	1021	11066
Avg. Gross Wt.	61.5	56.2	55.8	57.7	57.4	53.2	56.1	56.9
Standard Dev.	14.7	17.0	17.1	17.1	17.1	17.5	17.8	17.0
Avg. Axle 1 Wt.	10.2	10.1	10.0	10.1	10.0	10.0	10.0	10.0
Standard Dev.	.9	.9	.9	.9	.9	.9	1.0	.9

WSDBViewer

- Takes some “practice” to learn how to use effectively
- Compares static weights and measured axle spacings of test trucks with their WIM weights and spacings
- Supports use of Classes 5, 6, 9, 11, and 14 (32)
- Supports multi-sessions and up to four test trucks
- For analyses of calibration factors and accuracy validation

WSDBViewer procedure- on-site

- Insure that the required number of test truck runs are made throughout the specified speed ranges
- Record WIM system assigned vehicle number for each test truck pass
- Upon completion of each set of test truck runs, download the WIM data file(s) covering the period(s) of the test truck runs

Procomm Plus Terminal

File Edit View Options Data Tools Window Help

075 KEYS | startup

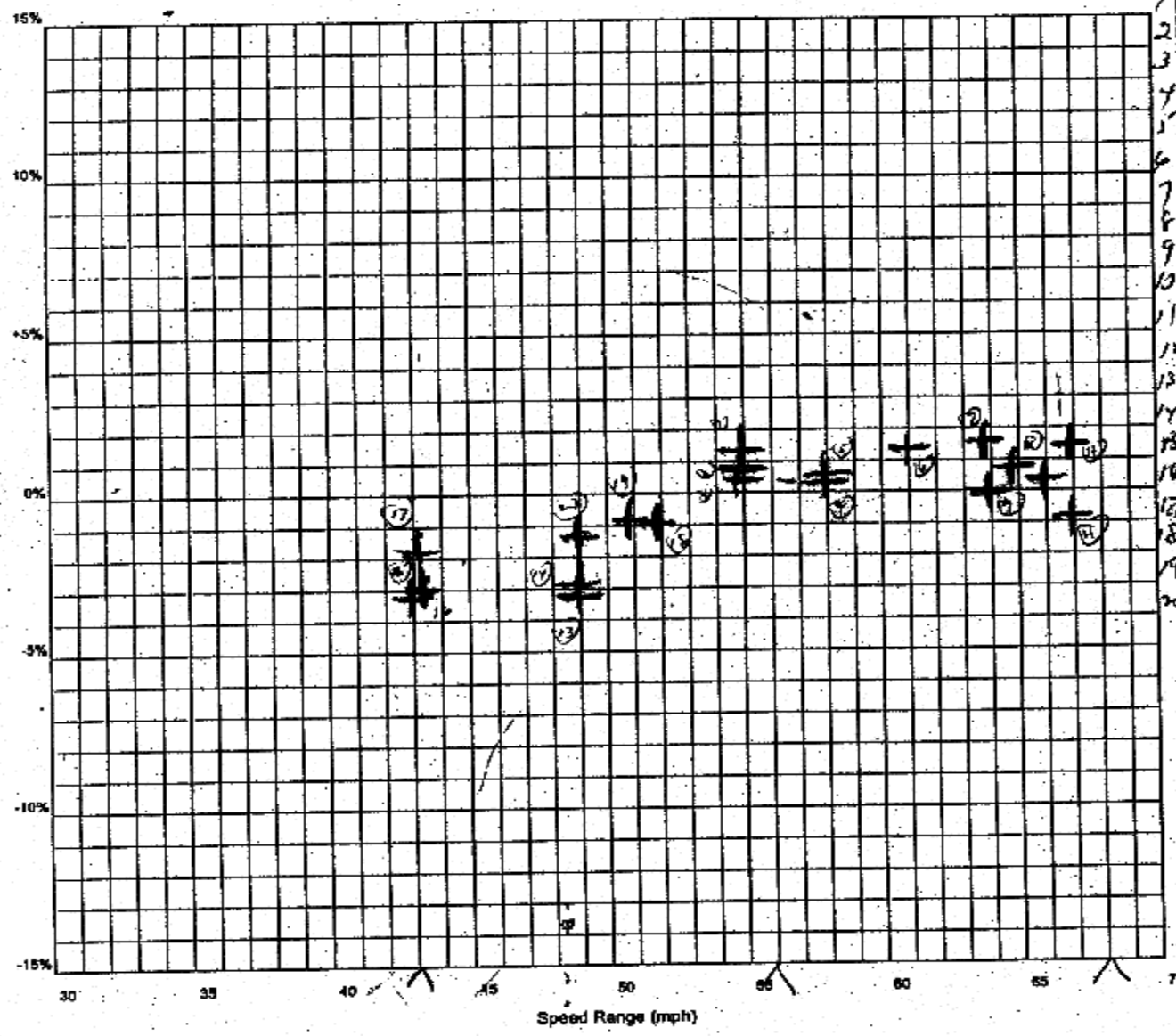
2	16.9	4.8	4.9	9.7	17.0
3	4.1	4.5	4.6	9.1	17.0
4	30.4	2.3	2.8	5.1	17.0
5	3.8	2.2	2.7	4.9	17.0

(48223) LANE NB#3 TYPE 9 GVW 32.5 kips LENGTH 55 ft
18-K ESAL 0.190 SPEED 54 mph MAX GVW 80.0 kips Wed Mar 13 19:07:05.21 2002

UNIT	SEPARATION (ft)	LEFT WT (kips)	RIGHT WT (kips)	TOTAL WT (kips)	ALLOWABLE (kips)
1		5.6	5.4	11.0	20.0
2	16.3	3.5	3.1	6.7	17.0
3	4.2	2.5	3.3	5.8	17.0
4	26.7	2.2	2.1	4.3	17.0
5	4.3	2.6	2.1	4.7	17.0

SITE: 106 LANE: 1 (NB 2) DATE: 2/27/02

GROSS ERROR RANGE BY SPEED RANGE



	VEHICLE NO.	76.5 GVW	CORR MPH	% ERROR
1	2021	77.6	54	+1.4
2	2444	77.2	54	+0.9
3	2702	76.9	54	+0.5
4	2905	76.7	58	+0.3
5	3106	76.9	58	+0.5
6	3301	77.6	61	+1.4
7	3740	77.9	64	+1.8
8	3911	77.2	65	+0.9
9	4089	76.5	64	0
10	4492	77.7	67	+1.6
11	4765	75.8	67	-0.9
12	5075	76.8	67	+0.4
13	5239	74.1	49	-3.1
14	5432	74.2	49	-3.0
15	5629	74.1	43	-3.1
16	5856	74.2	44	-3.0
17	6045	75.1	43	-1.8
18	6249	75.7	52	-1.0
19	6433	75.8	51	-0.9
20	6614	75.6	49	-1.2

LN 1

SITE: 106 LANE NO: 1 (NB 2) DATE: 2/27/02

TEST TRUCK STATIC DATA:			SPEED		11.6	30.6	34.3	76.5	18.9	4.3	26.4	10.1	63.5
	VEHICLE NUMBER		READ	CORR.	AXWT 1	AXWT 2/3	AXWT 4/5	GWV	AXSP 1/2	AXSP 2/3	AXSP 3/4	AXSP 4/5	OAL
1	2021	0847	54	-	11.2	31.8	34.7	77.6	19.0	4.3	26.3	10.1	65
2	2444	:58	54	-	11.1	31.6	34.6	77.2	19.2	4.3	26.7	10.2	65
3	2702		53	54	11.2	31.2	34.5	76.9	18.7		26.0		
4	2905	09:11	57	58	11.4	31.3	34.0	76.7	18.7		26.0		
5	3106	:18	57	58	11.4	31.2	34.3	76.9	19.2		26.6		
6	3301	:24	60	61	11.3	32.1	34.2	77.6	19.3		26.8		
7	3740	:40	64	-	11.3	32.4	34.1	77.9	18.9		26.1		
8	3911	:47	64	65	11.2	31.9	34.1	77.2	18.9		26.1		
9	4089	:53	65	64	11.1	31.8	33.6	76.5	19.3		26.7		
10	4492	10:08	67	-	10.9	32.8	33.9	77.7	19.1		26.6		
11	4765	:19	67	-	11.0	31.6	33.2	75.8	19.0		26.4		
12	5075	:30	68	67	11.0	31.7	34.1	76.8	19.2		26.7		
13	5239	:37	50	49	11.3	29.8	33.0	74.1	19.3		26.9		
14	5432	:44	50	49	11.2	30.0	33.0	74.2	19.3		26.9		
15	5629	:52	42	43	11.5	29.2	33.3	74.1	18.9		26.1		
16	5856	11:00	44	-	11.6	29.5	33.0	74.2	19.0		26.4		
17	6045	:08	43	-	11.4	29.5	34.3	75.1	19.2		26.6		
18	6249	:15	52	-	10.8	30.9	34.1	75.7	19.1		26.4		
19	6433	:23	50	51	10.9	30.8	34.0	75.8	18.6		25.8		
20	6614	:30	49	-	11.0	30.6	33.9	75.6	19.1		26.5		64

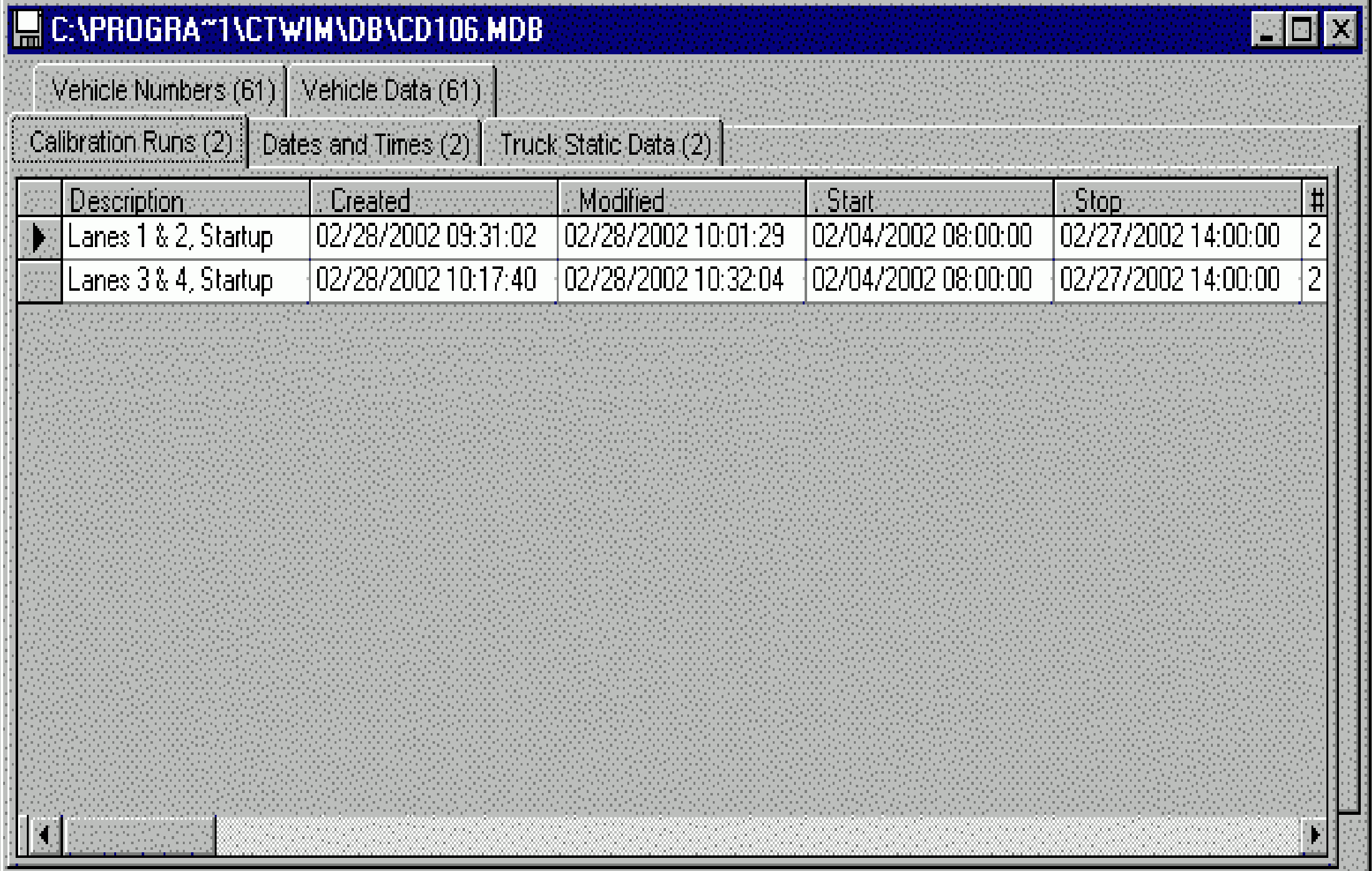
WSDBViewer procedure

Create the ASCII Truck Record files --

- Using the WIM vendor's application software, or
- Using spreadsheet import/export functions

WSDBViewer procedure

Create a ***Calibration Run*** to record the information obtained during a specific session of test truck runs.


C:\PROGRA~1\CTWIM\DB\CD106.MDB
Vehicle Numbers (61)
Vehicle Data (61)
Calibration Runs (2)
Dates and Times (2)
Truck Static Data (2)
Description
Created
Modified
Start
Stop
#
Lanes 1 & 2, Startup
02/28/2002 09:31:02
02/28/2002 10:01:29
02/04/2002 08:00:00
02/27/2002 14:00:00
2
Lanes 3 & 4, Startup
02/28/2002 10:17:40
02/28/2002 10:32:04
02/04/2002 08:00:00
02/27/2002 14:00:00
2

WSDBViewer procedure

For each set of test truck runs, record the ***Dates and Times*** when the testing occurred

C:\PROGRA~1\CTWIM\DB\CD106.MDB

Vehicle Numbers (61) | Vehicle Data (61)

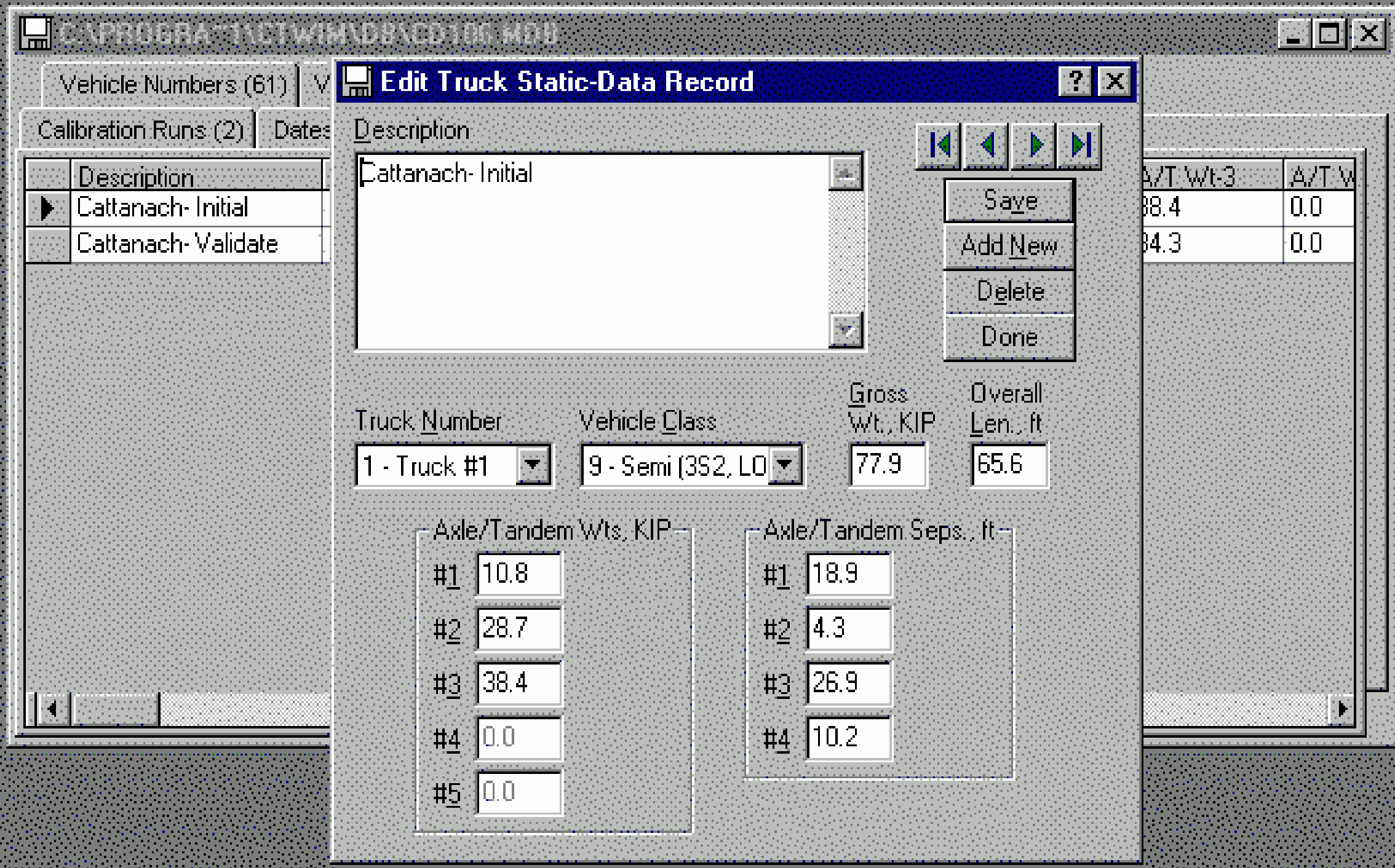
Calibration Runs (2) | Dates and Times (2) | Truck Static Data (2)

Description	Start	Stop
IRD Calibration	02/04/2002 08:00:00	02/04/2002 15:00:00
CT Validation	02/27/2002 08:00:00	02/27/2002 14:00:00

WSDBViewer procedure

Enter the static weight and axle space measurements for the test trucks into the ***Static Data Records***

CTWIM SUITE


Vehicle Numbers (61)
Calibration Runs (2)
Dates
Description
Cattanach- Initial
Cattanach- Validate
A/T Wt-3
A/T W
38.4
0.0
34.3
0.0
Edit Truck Static-Data Record
Description
Cattanach- Initial
Save
Add New
Delete
Done
Truck Number
1 - Truck #1
Vehicle Class
9 - Semi (3S2, LO
Gross Wt., KIP
77.9
Overall Len., ft
65.6
Axle/Tandem Wts, KIP
#1 10.8
#2 28.7
#3 38.4
#4 0.0
#5 0.0
Axle/Tandem Seps., ft
#1 18.9
#2 4.3
#3 26.9
#4 10.2

WSDBViewer procedure

Record the Vehicle Numbers of the test trucks in the ***Vehicle Numbers Table*** (must be entered in the same order as they appear in the WIM data-collection stream)

C:\PROGRA~1\CTWIM\DB\CD106.MDB

Calibration Runs (2) | Dates and Times (2) | Truck Static Data (2)

Vehicle Numbers (61) | Vehicle Data (61)

Truck	Veh. No.
1	11014
1	11217
1	11423
1	11602
1	11813
1	11981
1	12137
1	12329
1	12551
1	12714
1	12905
1	13118
1	13322
1	13541
1	13743

Edit Vehicle-Number Record

Vehicle Number(s)

11014,11217,11423,11602,11813,

Save
Insert New
Add New
Delete
Done

Truck Number

1 - Cattanach- Initial

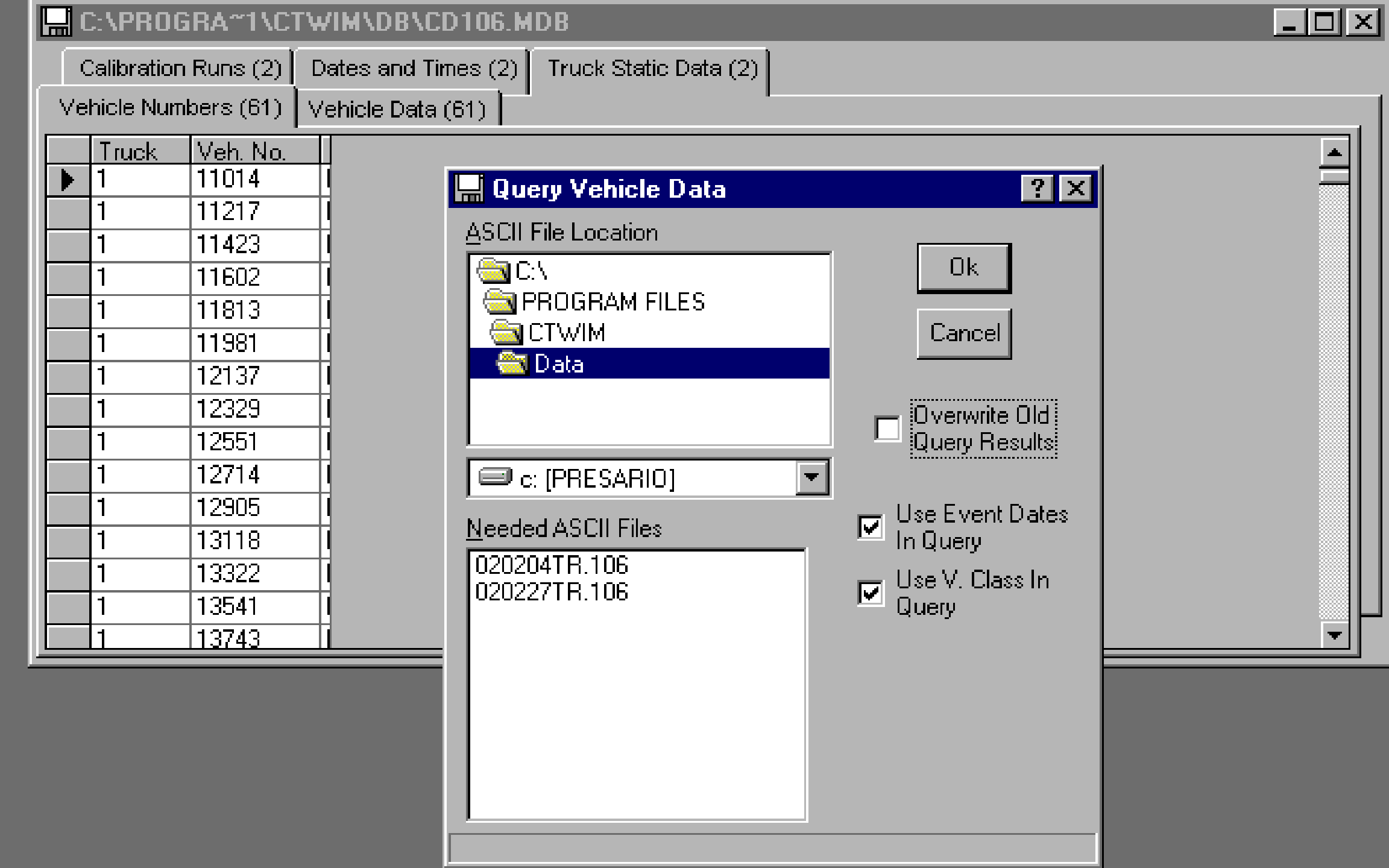
Status

Found

WSDBViewer procedure

Perform ***Query Vehicle Data*** procedure to import test truck WIM data

CTWIM SUITE


C:\PROGRA~1\CTWIM\DB\CD106.MDB
Calibration Runs (2)
Dates and Times (2)
Truck Static Data (2)
Vehicle Numbers (61)
Vehicle Data (61)
Truck
Veh. No.
1 11014
1 11217
1 11423
1 11602
1 11813
1 11981
1 12137
1 12329
1 12551
1 12714
1 12905
1 13118
1 13322
1 13541
1 13743
Query Vehicle Data
ASCII File Location
C:\
PROGRAM FILES
CTWIM
Data
c: [PRESARIO]
Needed ASCII Files
020204TR.106
020227TR.106
Ok
Cancel
Overwrite Old Query Results
Use Event Dates In Query
Use V. Class In Query

C:\PROGRA~1\CTWIM\DB\CD106.MDB

Calibration Runs (2) | Dates and Times (2) | Truck Static Data (2)

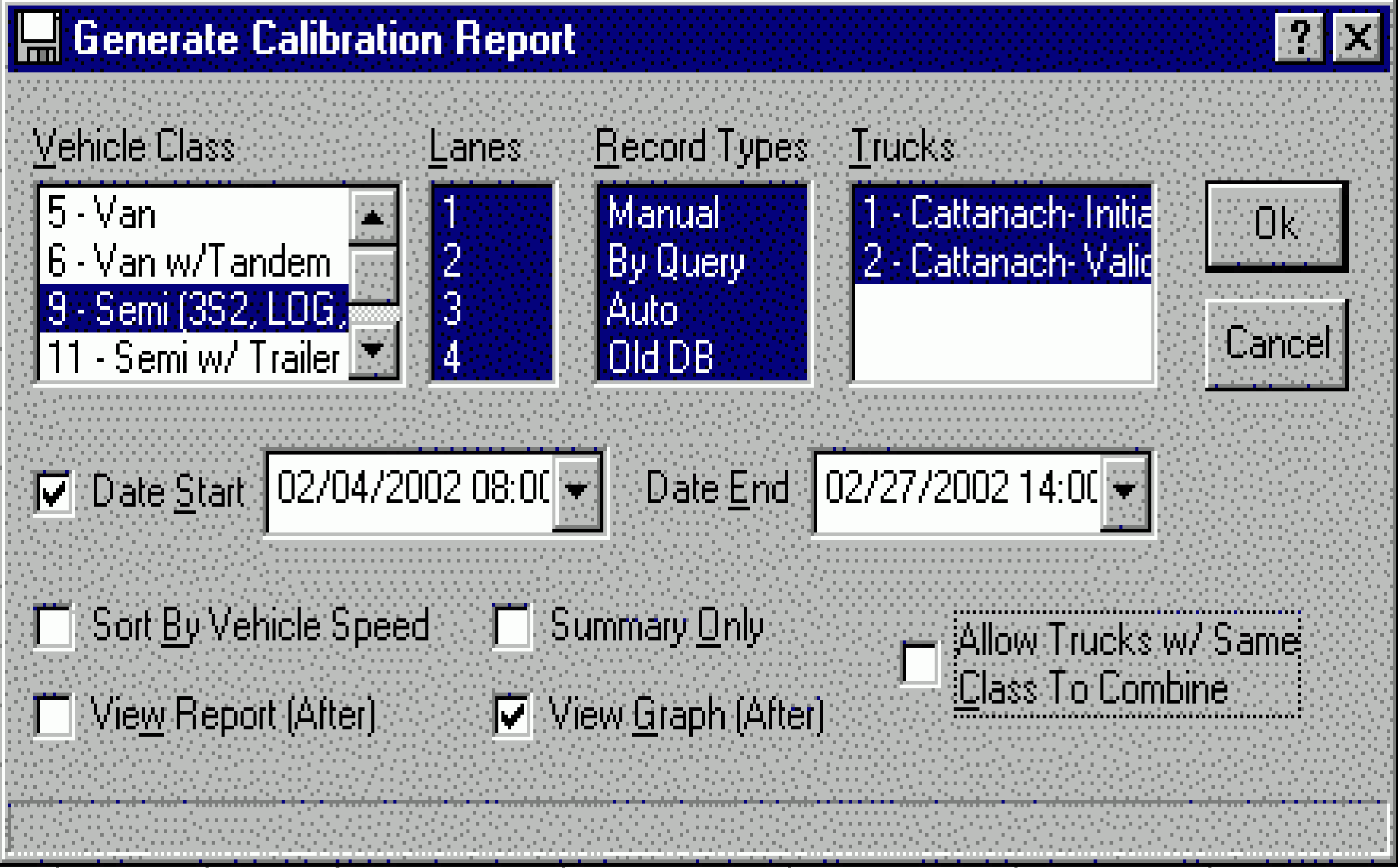
ehicle Numbers (61) | Vehicle Data (61)

. D/T Obtained	. Lane	. Truck	. Class	Gross Wt.	O. Len.	. Speed	Veh. No.	A/T Wt-1L	A/T Wt-1R	A/T Wt-2L
02/04/2002 10:51:37	2	1	9	77.7	65.2	64.0	14287	5.8	5.0	7.3
02/04/2002 10:57:59	2	1	9	77.3	66.3	65.2	14461	5.8	4.9	7.3
02/04/2002 11:03:51	2	1	9	77.0	64.9	57.8	14623	5.8	4.8	7.5
02/04/2002 11:11:20	2	1	9	78.3	67.2	60.3	14848	5.9	4.7	7.9
02/04/2002 11:17:40	2	1	9	77.3	65.6	52.2	15022	5.5	5.0	7.3
02/04/2002 11:23:48	2	1	9	76.5	66.7	52.2	15182	5.4	4.9	7.3
02/04/2002 11:31:01	2	1	9	76.8	65.7	44.7	15385	5.1	4.9	7.2
02/04/2002 11:37:56	2	1	9	78.0	65.7	44.7	15539	5.3	4.9	7.7
02/04/2002 11:44:44	2	1	9	77.9	66.3	55.3	15715	5.6	4.7	7.9
02/04/2002 11:50:54	2	1	9	77.8	65.7	57.2	15888	5.6	4.8	7.9
02/27/2002 08:47:13	1	2	9	77.6	65.1	55.3	2021	5.6	5.5	8.1
02/27/2002 08:57:52	1	2	9	77.2	65.9	55.3	2444	5.5	5.5	7.7
02/27/2002 09:05:11	1	2	9	76.9	64.0	52.8	2702	5.5	5.6	7.4
02/27/2002 09:11:18	1	2	9	76.7	64.2	57.2	2905	5.6	5.7	7.7
02/27/2002 09:17:53	1	2	9	76.9	65.9	57.8	3106	5.7	5.6	7.6
02/27/2002 09:24:07	1	2	9	77.6	66.2	60.3	3301	5.6	5.6	7.9
02/27/2002 09:39:43	1	2	9	77.9	64.8	64.0	3740	5.5	5.8	7.9
02/27/2002 09:46:32	1	2	9	77.2	64.6	64.0	3911	5.3	5.8	7.6
02/27/2002 09:53:03	1	2	9	76.5	66.5	65.9	4089	5.3	5.7	7.8
02/27/2002 10:08:03	1	2	9	77.6	65.9	67.1	4492	5.2	5.6	7.9
02/27/2002 10:19:04	1	2	9	75.8	65.3	67.1	4765	5.3	5.6	7.6

WSDBViewer procedure

Run the Calibration Report

- Select the appropriate filter-criteria and options to limit the report's scope and set its content


Generate Calibration Report
Vehicle Class
5 - Van
6 - Van w/Tandem
9 - Semi [3S2, LOG,
11 - Semi w/ Trailer
Lanes
1
2
3
4
Record Types
Manual
By Query
Auto
Old DB
Trucks
1 - Cattanach- Initia
2 - Cattanach- Valid
Ok
Cancel
Date Start
02/04/2002 08:0(
Date End
02/27/2002 14:0(
Sort By Vehicle Speed
Summary Only
Allow Trucks w/ Same
Class To Combine
View Report (After)
View Graph (After)

WSDBViewer

What are the outputs of this application?

- Graphs and reports for calibrating a WIM system (adjusting system calibration factors)
- Summary statistical reports for determining compliance with validation requirements

WSDBViewer - Calibration Analyses

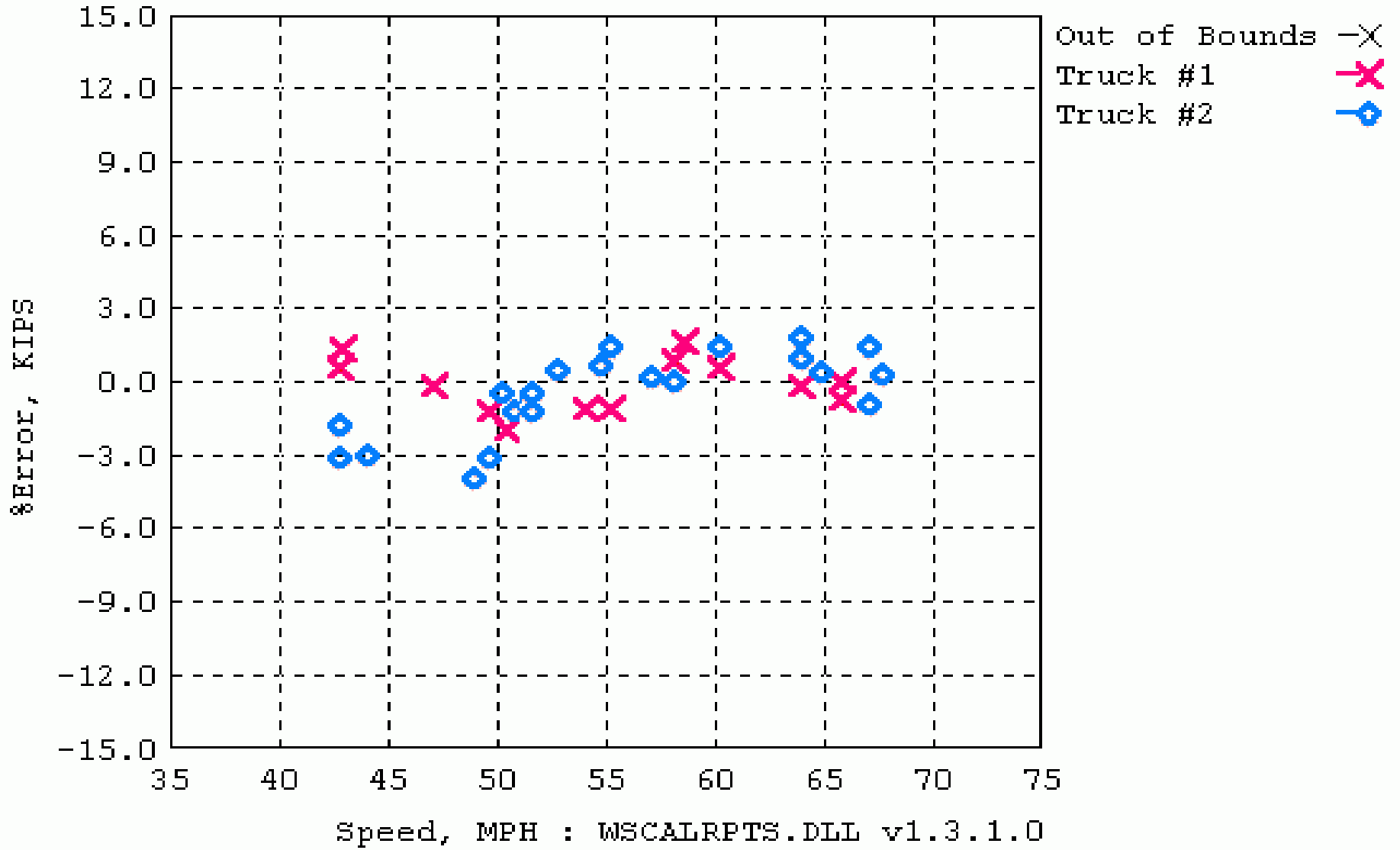
Examine plots of test trucks' gross weight and axle/axle group weight patterns through the entire range of speeds to determine what WIM system calibration weight factor settings will result in the system's generating the most accurate estimate of static weights for the most typical trucks in the traffic stream

CTWIM SUITE

Caltrans specifications require that:

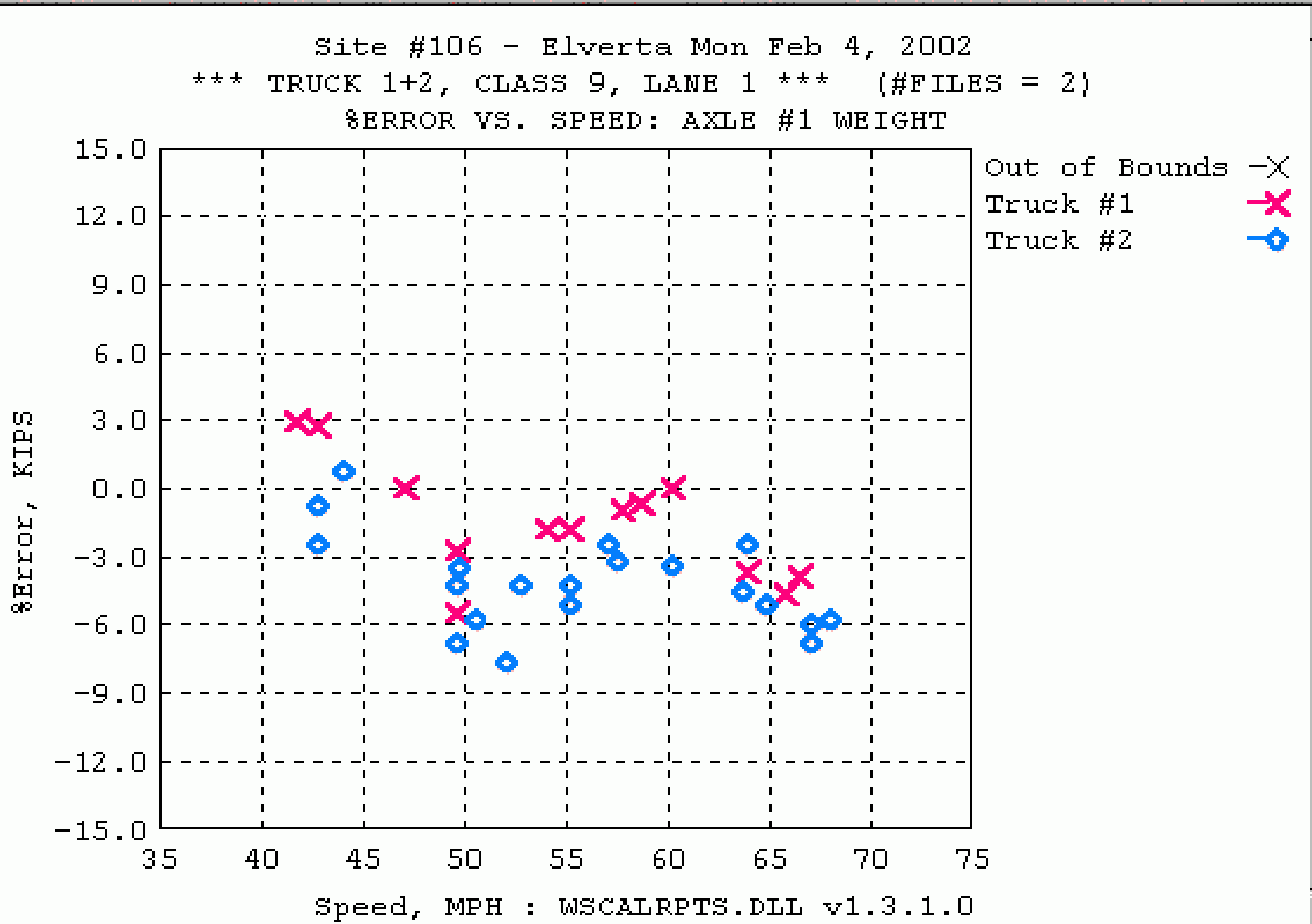
"The WIM system shall provide for calibration features such that the required accuracies can be met at all speeds within the operating speed range set forth under …"

C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



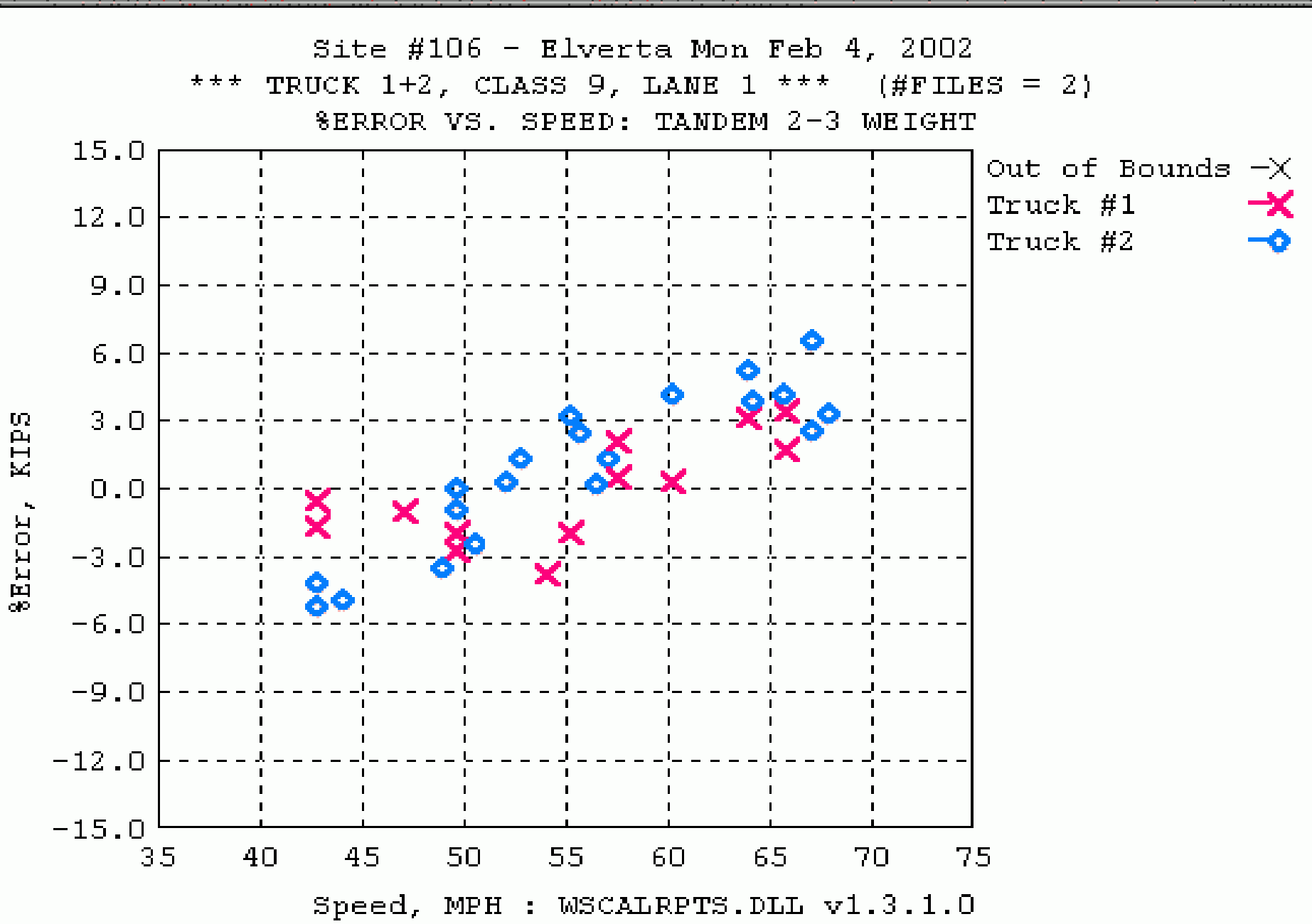
Type=Calibration Graph, Site=106, File Date=02/04/2002, Mod. Date=02/28/2002 16:56:44

C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



Type=Calibration Graph, Site=106, File Date=02/04/2002, Mod. Date=02/28/2002 16:56:44

C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



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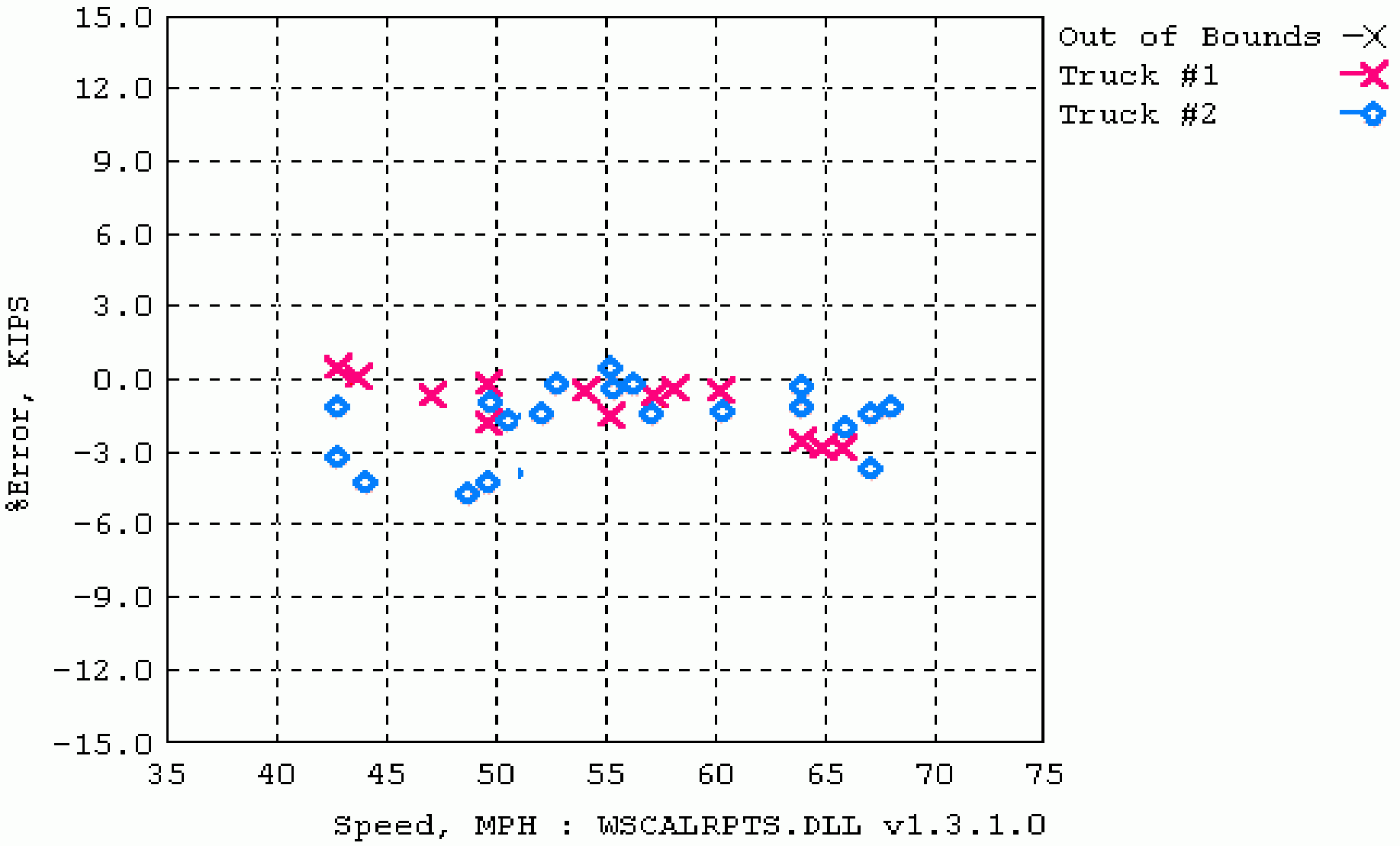
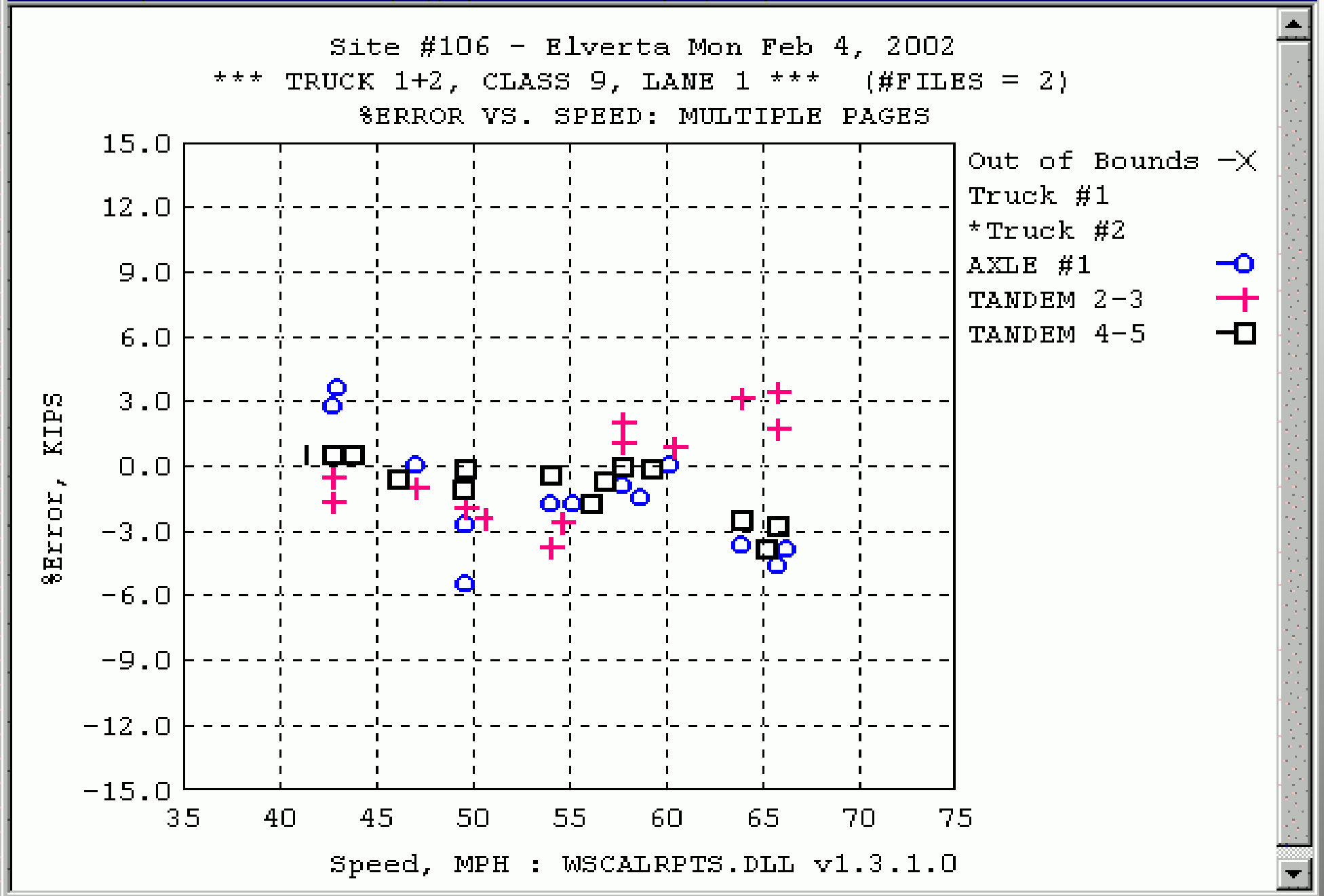
C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



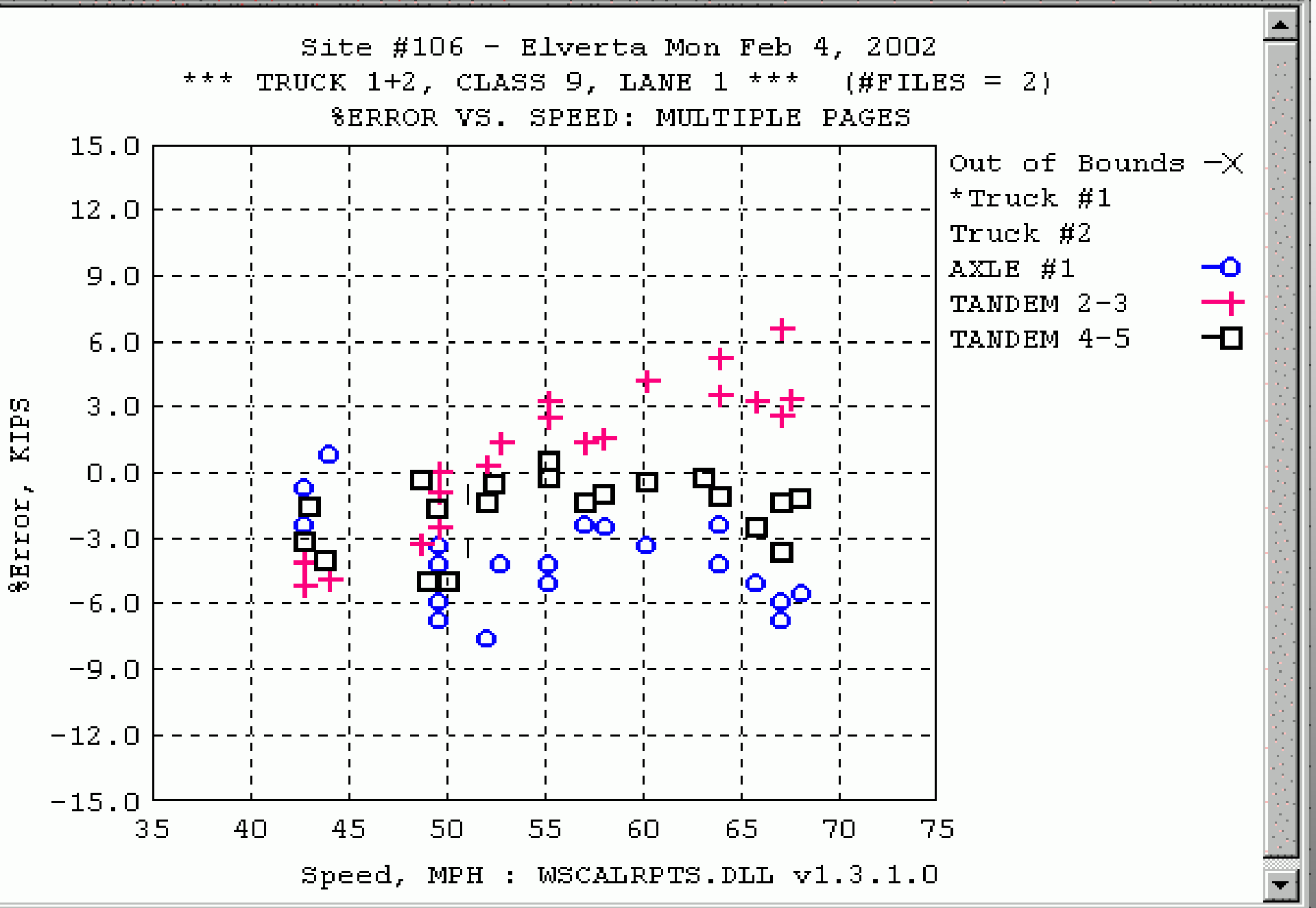
Type=Calibration Graph; Site=106; File Date=02/04/2002; Mod. Date=02/28/2002 16:56:44

C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



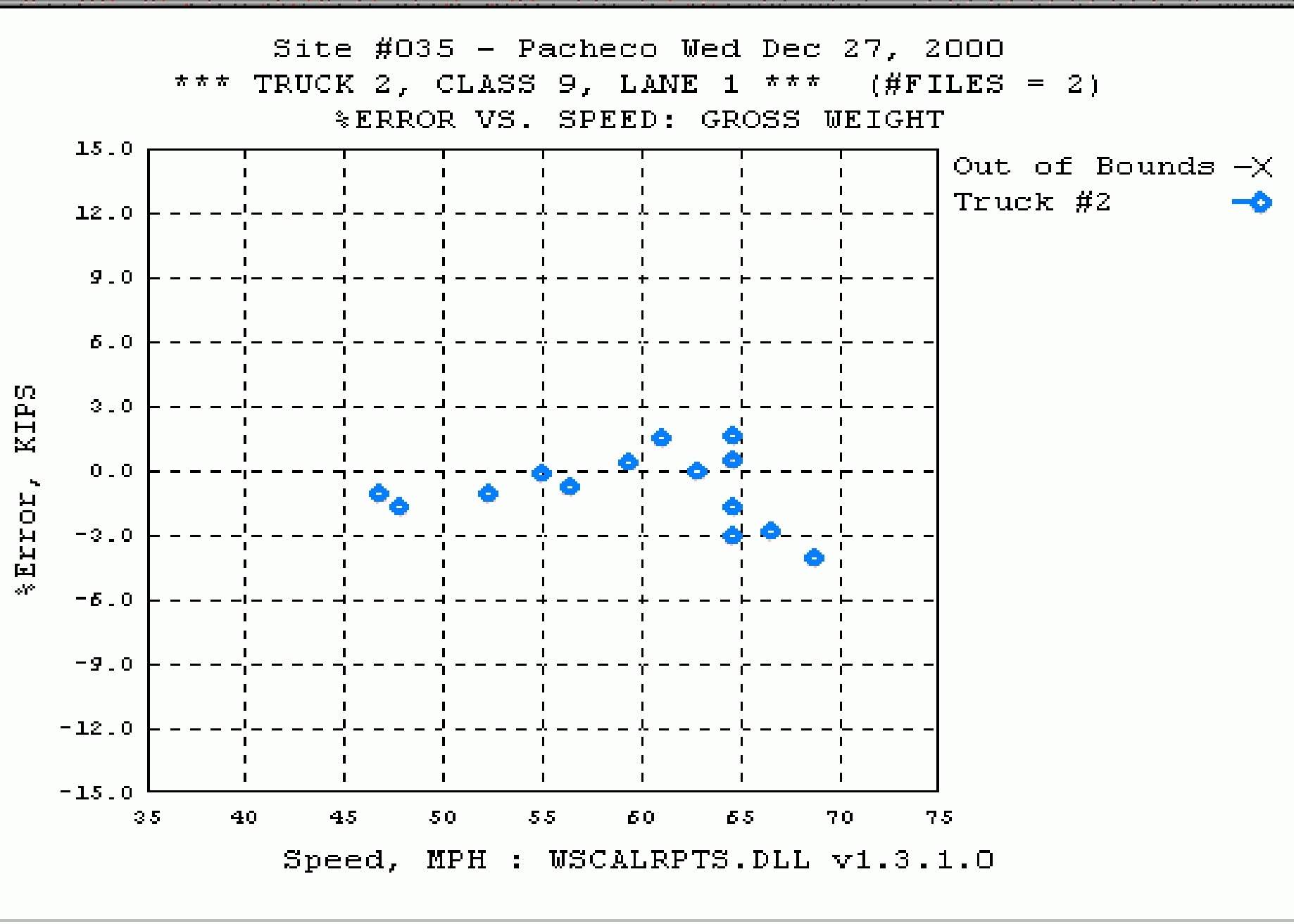
Type=Calibration Graph; Site=106; File Date=02/04/2002; Mod. Date=02/28/2002 16:56:44

C:\PROGRAM FILES\CTWIM\Rpts\GC020204.106.CGF



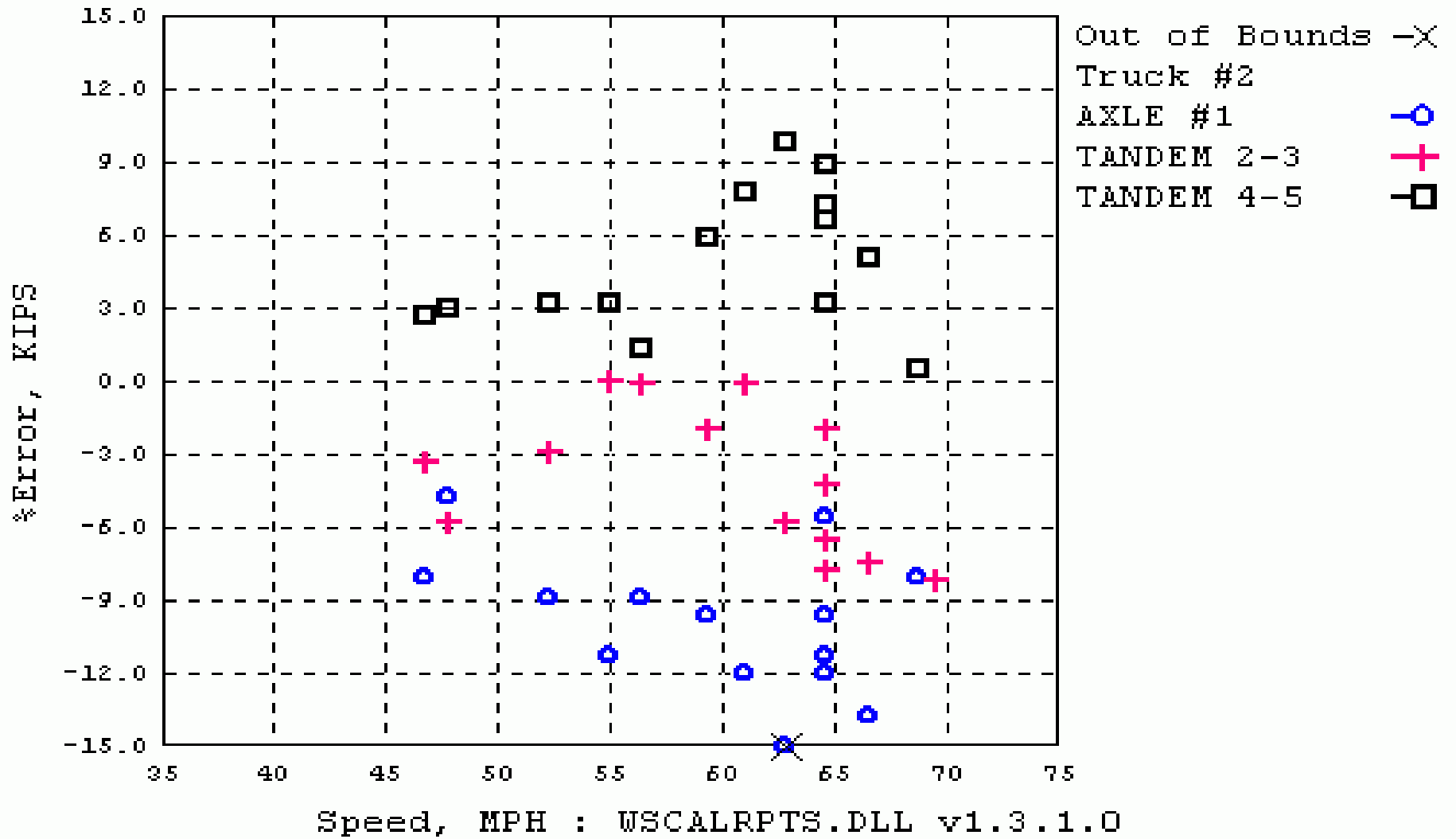
Type=Calibration Graph; Site=106; File Date=02/04/2002; Mod. Date=02/28/2002 16:56:44

C:\PROGRAM FILES\CTVIM\Rpts\GC001227.035.CGF



Type=Calibration Graph; Site=35; File Date=12/27/2000; Mod. Date=03/21/2002 20:11:10

C:\PROGRAM FILES\CTWIM\Rpts\GC001227.035.CGF



Type=Calibration Graph; Site=35; File Date=12/27/2000; Mod. Date=03/21/2002 20:11:10

WSDBViewer - Calibration Analyses

What is the purpose of these graphical comparisons?

- Should one of the axle groups be tossed out in determining calibration factor adjustments?
- Is the WIM system "calibratable"?

CTWIM SUITE

WSDBViewer - Calibration Analyses

Examine ***WIM VS STATIC WTS/SPACINGS DETAILED REPORT*** to determine

- Should any of the test truck record be dumped
- Corrections to be applied to systems speed/spacings factors

WIM VS. STATIC WTS/SPACINGS DETAIL REPORT

Site #106 - Elverta Mon Feb 4, 2002

*** TRUCK 1+2, CLASS 9, LANE 1 *** (#FILES = 2)

		Speed,	Axle Weights, KIPS					GW,	Axle Spacing, ft.				O. Len,
Trk #	Veh #	MPH	1	2	3	4	5	KIPS	1-2	2-3	3-4	4-5	ft.
1	11217	55.3	10.6	13.9	14.2	19.4	18.4	77.0	18.9	4.2	27.0	10.2	67.2
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-1.9	-2.1		-1.6		-1.2	0.0	-2.3	0.4	0.0	2.4
1	11423	54.1	10.6	14.0	13.6	19.9	18.3	77.0	18.8	4.1	26.7	10.1	66.1
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-1.9	-3.8		-0.5		-1.2	-0.5	-4.7	-0.7	-1.0	0.8
1	11602	60.3	10.8	14.5	14.3	19.7	18.5	78.4	18.9	4.2	27.1	10.3	67.0
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-0.0	0.3		-0.5		0.6	0.0	-2.3	0.7	1.0	2.1
1	11813	57.8	10.7	15.0	14.3	19.4	18.6	78.6	18.6	4.1	26.5	10.0	65.8
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-0.9	2.1		-1.0		0.9	-1.6	-4.7	-1.5	-2.0	0.3
1	11981	57.8	10.7	14.3	14.7	19.6	18.6	78.3	18.5	4.1	26.3	10.0	65.4
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-0.9	1.0		-0.5		0.5	-2.1	-4.7	-2.2	-2.0	-0.3
1	12137	65.9	10.3	14.8	14.9	19.1	18.2	77.9	19.2	4.2	27.3	10.4	68.1
		STATIC	10.8	28.7		38.4		77.9	18.9	4.3	26.9	10.2	65.6
		%ERR.	-4.6	3.5		-2.9		-0.0	1.6	-2.3	1.5	2.0	3.8
1	12329	65.9	10.3	14.1	15.1	19.1	18.1	77.2	19.1	4.2	27.3	10.4	68.1

2	6249	52.2	10.7	15.6	15.1	17.1	16.7	75.7	19.0	4.2	26.4	10.2	65.4
		STATIC	11.6		30.6		34.3	76.5	18.9	4.3	26.4	10.1	63.5
		%ERR.	-7.8		0.3		-1.5	-1.0	0.5	-2.3	0.0	1.0	3.0
2	6433	49.7	10.8	15.4	15.2	17.1	16.7	75.8	18.6	4.1	25.7	9.8	63.5
		STATIC	11.6		30.6		34.3	76.5	18.9	4.3	26.4	10.1	63.5
		%ERR.	-6.9		0.0		-1.5	-0.9	-1.6	-4.7	-2.7	-3.0	0.0
2	6614	49.7	10.9	15.3	15.0	17.4	16.5	75.5	19.0	4.2	26.5	10.1	66.0
		STATIC	11.6		30.6		34.3	76.5	18.9	4.3	26.4	10.1	63.5
		%ERR.	-6.0		-1.0		-1.2	-1.3	0.5	-2.3	0.4	-0.0	3.9
N=33		MEAN	-3.2		0.5		-1.5	-0.3	0.0	-2.9	-0.1	0.0	2.4
		S.D.	2.6		3.0		1.4	1.4	1.0	1.3	1.2	1.3	1.6

/SUMMARY/		Single	Tandems	Gross Wt	Spacing	O. Len	(*)Ignr'd
Lane #1	N	33	66	33	132	33	0
	MEAN	-3.2	-0.5	-0.3	-0.7	2.4	
	S.D.	2.6	2.5	1.4	1.8	1.6	

WSDBViewer - Validation Analyses

Examine ***WIM VS STATIC WTS/SPACINGS STATISTICS REPORT*** to determine compliance with accuracy validation requirements

CTWIM SUITE

WIM VS. STATIC WTS/SPACINGS STATISTICS REPORT

Site #106 - Elverta Mon Feb 4, 2002

*** TRUCK 2, CLASS 9 *** (#FILES = 2)

/STATISTICS/		Axle Weights, KIPS				GW,	Axle Spacing, ft.				O. Len,
		1	2 + 3	4 + 5		KIPS	1-2	2-3	3-4	4-5	ft.
Lane #1	MEAN	-4.2	0.9	-1.7		-0.4	0.0	-0.1	0.0	0.0	1.8
N=20	S.D.	2.1	3.4	1.5		1.7	0.1	0.1	0.3	0.1	0.9
Lane #2	MEAN	-7.7	-3.5	-2.6		-3.1	0.1	-0.1	0.1	0.0	1.8
N=14	S.D.	2.8	1.5	1.5		1.2	0.2	0.0	0.2	0.1	0.7

/SUMMARY/		Single	Tandems	Gross Wt	Spacing	O. Len	Ignr'd
Lane #1	N	20	40	20	80	20	0
	MEAN	-4.2	-0.4	-0.4	0.0	1.8	
	S.D.	2.1	2.9	1.7	0.2	0.9	
Lane #2	N	14	28	14	56	14	0
	MEAN	-7.7	-3.0	-3.1	0.0	1.8	
	S.D.	2.8	1.5	1.2	0.1	0.7	

NOTES:

Gross Weight, Axle Wts., Single, and Tandem values are percent-error.

Spacing and Overall Length values are in feet.

10-3.__ HIGH SPEED WIM FUNCTIONAL REQUIREMENTS

1. **The WIM System shall be able to accommodate vehicles and vehicle combinations with up to nine axles and shall automatically determine for each vehicle, by lane of travel:**

A. Weight of each axle:

Accuracy:	MEAN	STD. DEV.
single axle	±5%	8%
tandem axle	±5%	6%
gross weight	±5%	5%

B. Axle Spacing, Vehicle Length, and Speed:

Accuracy:	MEAN	STD. DEV.
Axle Spacing	±6" (±0.152 m)	12" (0.305 m)
Vehicle Length	±12" (±0.305 m)"	18" (0.457 m)
Speed	±1 mph (±1.61 Km/h)	2 mph (3.22 Km/h)

WIM System Calibration Tolerances ASTM E1318-00

	95 Percent Confidence Limit of Error
Loaded single axles	±20 percent
Loaded tandem axles	±15 percent
Gross vehicle weights	±10 percent
Vehicle speed	±1 mph [2 km/hr]
Axle spacing length	± 0.5 ft [150 mm]

ABS (X • 1.96 σ)
should be less than these values

LTPP


KOHEL
KOHEL